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DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

The Metropolitan Line and the L.N.E.R.

IMMEDIATELY upon the formation of the London Passenger Transport Board it became obvious that there might be considerable modifications in the train services on the Metropolitan and Great Central lines, and it was clear that this would be a problem which would almost immediately occupy the attention of the board. Although there have been rumours of the likely policy to be pursued in this matter, it was not until Mr. Frank Pick was asked on Tuesday last by Sir Henry Cautley, Chairman of the Opposed Bills Committee of the House of Commons, whether there was any likelihood of Marylebone ceasing to be used as a terminus, that any official indication of policy has been given. Mr. Pick's reply was not without significance, when he said that it was likely that Marylebone would be used more. It was a mere accident that the Metropolitan Railway went out to Aylesbury and the London Passenger Transport Board could not be expected to run suburban services there. He could not commit himself, but he could say that it was a matter for discussion whether the L.N.E.R. should take over all services to Aylesbury with an exchange of passengers at Amersham, which would be the ultimate point of the intensive suburban service. This would seem to confirm the development suggested in a footnote to a letter to the editor on page 789 in THE RAILWAY GAZETTE of November 16, 1934. Moreover, it would seem evident that the board has deserted the old Metropolitan tenet that it should be considered a main-line railway.

* * * *

Chief Commissioner of Railways in India

A small but important amendment to the Government of India Bill was agreed to in committee in the House of Commons on Tuesday. The original draft provided that the Chief Commissioner of Railways was to be appointed by the Railway Authority, subject to the confirmation of the Governor General, whereas in accordance with this amendment, he will be appointed by the Governor General exercising his individual judgment, but after consulting with the Railway Authority and with the Ministers concerned. The change in the wording is important from the railway point of view in that it tends to ensure that the appointment of the chief executive officer, who will exercise control over the 43,000 miles of railway in India, shall be made primarily on merit, irrespective of other considerations. Even as amended the clause cannot guarantee this ideal, but it is at least more likely to do so than if the appointment rested with the Railway Authority, albeit with the Governor General's confirmation. It is to be hoped that the holder of such a responsible appointment will always be the best man—administratively and technically—available, whatever his nationality, race or creed.

* * * *

The Week's Traffics

Passenger traffics of the four group companies for the past week benefited from the Jubilee celebrations and were all up, but general merchandise and coal traffics were all down, affected no doubt by the absence of one working day. For the year to date the aggregate increase shown by the four companies together in passenger train receipts is £638,000, whereas in general merchandise there is a decrease of £330,500 and in coal class receipts a decrease of £423,500, making an overall net decrease of £116,000. The most striking results for the past week are those of London Transport with gross receipts of £658,200, an increase of £110,800. For the first four week-days of Jubilee Week approximately 46,000,000 passengers travelled on London Transport undertakings, of whom 7,230,000 used the Underground, 24,950,000 the buses, 220,000 the coaches, and 13,180,000 the trams. The heaviest day was the Monday, when 12,060,000 passengers travelled, the average for the three subsequent days being over 11,000,000.

	19th Week				Year to date.	
	Pass., &c.	Goods, &c.	Coal, &c.	Total.	Inc. or dec.	
	£	£	£	£	£	%
L.M.S.R.	+ 36,000	− 26,000	− 25,000	− 15,000	+ 74,000	+ 0·36
L.N.E.R.	+ 38,000	− 35,000	− 21,000	− 18,000	− 190,000	− 1·23
G.W.R.	+ 16,000	− 29,000	—	− 13,000	− 41,000	− 0·48
S.R.	+ 47,000	− 9,500	− 2,500	+ 35,000	+ 41,000	+ 0·63

* * * *

Encouraging the "Fans"

Time was when the inquisitive interest of the young railway enthusiast in the equipment and operation of the railways was not generally welcomed by railway managements, but by some was discouraged and even frowned upon. In these days we have learned more wisdom. The railway fan is one of its best propagandists; trips that he makes by the railways are a source of revenue; and the development of the "railway idea" in those that are younger does much to produce the potential railway traveller of tomorrow. The same lesson is being learned

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in countries other than our own. Our American contemporary, the *Railway Age*, reveals details of a trip organised on April 27 by three New York railroad societies, in conjunction with the New York Central Lines, to Harmon, 32 miles out—an important main line locomotive depôt at which the electric locomotives used under the Hudson give place to steam. Facilities were given "to inspect the engine shops and signal tower," and opportunity was afforded "to take pictures, get into the locomotives, and, in short, do everything that fans have asked to do around railroads." Participation was not confined to the societies concerned, but was extended to all railway enthusiasts. We trust that the venture met with the success that it deserved.

* * * *

General W. W. Atterbury

On April 22 it was announced that General W. W. Atterbury, President of the Pennsylvania Railroad since October 1, 1925, had decided to retire from the post on grounds of ill health, and that Mr. M. W. Clement had been elected to succeed him. General Atterbury was born at New Albany, Ind., on January 31, 1866, so that his retirement would in any case have fallen due next year, on his seventieth birthday. His association with the Pennsylvania Company extends over nearly 49 years, and he was one of the few railway presidents in the United States to have come to the post by way of the Mechanical Department, which he entered as an apprentice at the Altoona shops on October 11, 1866. The unusual course of his career is the more remarkable in that it led to the highest position in a railway which has become an accepted leader in the American transport industry. His connection with the Mechanical Department culminated with his appointment as General Superintendent of Motive Power of the Pennsylvania Lines east of Pittsburg and Erie on October 1, 1901. He joined the Traffic Department on January 1, 1903, when he became General Manager of the same division, and he was made a Vice-President on March 24, 1909. After the war, in which he acted as Director General of the American Expeditionary Forces from August, 1917, he resumed his former duties, though now serving in a more widely executive capacity, and was elected President on October 1, 1925. General Atterbury's pronouncements on railway and public affairs were always listened to with the respect and attention due to one whose capacity for efficient leadership was recognised.

* * * *

British Guiana Transport

The Transport and Harbours Department of British Guiana controls railways, steamer services, the Bartika-Potaro road services, and harbour services. From the combined undertakings there was in 1934 a net revenue of $109,127, an increase of $13,159 over 1933, and the actual cost to the colony in 1934, after allowing for interest charges, sinking fund, &c., amounted to $90,454, or $19,384 less than in 1933. The cost would have been considerably less had it not been for severe floods in January, coupled with subsequent drought, which seriously affected railway goods traffic revenue and necessitated heavy expenditure on re-conditioning. Railway passenger traffic, however, constituted a record, and more coaching stock is urgently required. Figures in the accompanying table refer only to the railways, of which there are two separate sections of different gauges (4 ft. 8½ in. and 3 ft. 6 in.), comprising 91 track miles in all. The British Guiana dollar is roughly equivalent to the U.S. dollar. The Bartika-Potaro road service has grown considerably, and it has been necessary to appoint a whole-time road transport officer and increase the number of lorries operating.

	1934	1933
Passengers	1,320,212	1,293,471
Tons	79,432	86,348
	$	$
Coaching receipts	201,487	193,410
Goods traffic receipts	118,711	130,283
Gross receipts	329,938	331,298
Working expenditure	306,880	309,791
Net receipts	23,058	21,507

* * * *

London Transport Automatic Lifts

It is their gift of speech which has done most to attract attention to the three lifts at the Strand station of London Transport which have recently been fitted with automatic control. Otherwise, the principle of self-working lifts is not new, having been adopted at Earl's Court on October 9, 1932. The Strand lifts, however, are controlled by an entirely new form of apparatus, and in addition to each being able to run independently, all three automatically space their sequence of operations to give a regular time interval at the landings as soon as they are brought into use. This interval, with the whole series running, is 37 sec., compared with 1 min. at Earl's Court. The correct order of opening and closing the exit and entrance doors and starting and stopping is maintained by relays similar to those at automatic telephone exchanges, which release electric impulses to work the control switches for each operation. In addition to the audible "Stand clear of the gates" warning provided by a strip of sound track film on a drum rotating at a constant speed, a sign is exhibited conveying the same message visually before each set of gates closes. At their maximum frequency, the lifts allow 14 sec. for loading and unloading at the landings.

* * * *

Summer Speed in France

As usual, the French summer timetables contain much that is of interest in the acceleration and improvement of service that they reveal. For the first time in history the French and Belgian capitals are brought within 3 hr. of one another by rail, the *Oiseau Bleu* Pullman being now accelerated to this time from Paris to Brussels, which entails an average speed of 64·4 m.p.h. throughout, and as high as 67·5 m.p.h. for 134 miles on the French side of the frontier. By Bugatti railcar, Paris and Havre are now, twice daily in both directions, no more than 2 hr. apart in time, though 141·5 miles apart in distance; the speed of the quickest start-to-stop booking on this service has risen to 73·2 m.p.h. The two railcars on the Paris-Deauville service also maintain their previous average speed of 68·1 m.p.h. on their 136·2-mile run. These railcars are Etat enterprises, and this railway easily takes the lead in France in railcar development. Its latest innovation is an express railcar across country from Dieppe to Rouen, Alençon, Le Mans, Angers, and Nantes, and back, making connection between the night Newhaven steamer service at Dieppe, and the Côte d'Emeraude-Pyrenées express at Nantes. Between Dieppe and Nantes it is a cross-country route of considerable intricacy that is followed; nevertheless the railcar maintains an average speed, including seven stops, of precisely 60 m.p.h. throughout. Once again the Sud Express has had a cut made in its times, which, though of 6 min. only, now brings the overall time for the 362·0 miles from Paris (Quai d'Orsay) to Bordeaux down to 5 hr. 49 min., the actual running time to 340 min., and the overall speed up to 62·2 m.p.h., four stops included.

The Resignalling of Fenchurch Street

Fenchurch Street station is off the beaten track compared with most London termini, and the railwayman who looks round it and the station yard for the first time is probably struck by three things. These are, first, that the more important passenger services belong, not to the owning company—the L.N.E.R.—but to a " foreign " system—the L.M.S.R.; secondly, the connections outside the station with goods warehouses, two of which belong to the L.M.S.R.; and thirdly, that the traffic carried on four lines of way up to Stepney has to be concentrated on to two lines for the mile that intervenes between that point and the junction with the Tilbury line. The last-named feature furnished a perplexing problem, but as related in our article on pp. 974-979 herein, it has been met by signalling for trains at a 1½-min. headway, to correspond with the 3-min. headway between the station and Stepney. Seeing that when the Hampstead tube of the Underground system was given a 1½-min. headway, the fact was considered remarkable, what has been done outside Fenchurch Street becomes more so, as here the trains are heavier, longer and, being steam-worked, have less accelerating and decelerating power.

* * * *

Level Crossing Gate Lamps

We noticed recently that the gates of the level crossing of Sheen Lane over the railway at Mortlake station, Southern Railway, are provided with a new type of gate lamp which meets two difficulties, both of which have been aggravated by the growth of road motor traffic. The objections to the usual lamps are (1) that when the gates are across the roadway a red light is exhibited towards the road and a white light along the railway. During the travel of the gates to open the roadway the red light generally disappears from the view of the driver of a road vehicle and he may move before the gates are fully opened and collide with them; and (2) that when a set of gates is approached by a road but is on a curve, the fact that the gates are closed against road traffic is not, owing to the rigid beam from the gate lamp, appreciated by a driver until he almost directly faces it. Both these troubles appear to have been met by the provision of a gate lamp with a lens curved like a ships' lamp, but having a range through the greater part of a semicircle. The down-side gates at Mortlake are approached by the straight Sheen Lane and by two other side roads, one from the left and one from the right. Each road gets a full red light when the gates are closed against the road and, when they are being opened for road traffic, the red light is exhibited until the gates are closed across the railway. We understand that this is one of a score or so of such crossings on the Southern Railway that have been so equipped, and that the lamps have been supplied by Lamp Manufacturing & Railway Supplies Limited.

* * * *

Early Automatic Signals in Budapest

The mention made in an editorial note in our issue of May 10 of the electric automatic signals constructed by Timmis in 1893 for the Liverpool Overhead Railway recalls the fact that three years later the underground line in Budapest was fitted with automatic signals also, on a plan proposed by Siemens & Halske. A description of the apparatus—as well as of the Liverpool Overhead signals—appears in a little known book by the Continental signalling historian L. Kohlfürst, entitled " Automatic Signalling on Tramways, Light Railways, and Main Lines " —and published thirty-two years ago. This book reveals a surprising number of attempts to construct automatic signals up to that time. In 1896 the Budapest Underground Railway, which was 3·7 km. (2·3 miles) long, with 11 stations, was divided into block sections by the provision of starting signals at each station. They were light signals, showing red or white for *Stop* or *Proceed*, and were repeated at the station in advance by duplicate signals to enable the station staff to know when a train was in section. The controls were produced by a treadle switch, operated by a roller on the rear bogie of the train, the inside portion of which was driven round, 90 deg. at a time, step by step, by each train; it acted as a change-over switch, illuminating the red and white signal lenses alternately, thus blocking a section and clearing the one in the rear simultaneously.

* * * *

American Lightweight Railway Coaches

Some new partially streamlined *de luxe* carriages for use in main line service, as well as some further vehicles for suburban duties, are being introduced on the Boston & Maine Railroad, and in both series extensive use has been made of alloy steels to reduce the weight. The interiors have been decorated in light colour tones, which in the case of the main line vehicles have been given distinction by the skilful use of striping in contrasting colours. The *de luxe* cars are fitted with electro-mechanical air-conditioning equipment and in both cases a simple but unusual type of lighting fixture has been adopted, which produces a highly uniform distribution of light across the coach at reading level, and effects a bright but well diffused lighting of all the interior surfaces. Each main line coach has seats for 84 passengers; the suburban coaches seat 98 persons each. In the *de luxe* coaches care has been taken to provide smooth exterior surfaces which not only tend to improve the uniform appearance of the vehicles but also assist in reducing wind resistance. The fixed window sashes are placed as nearly flush with the outside sheathing as possible and the sheathing is unbroken from end to end of the car; the roofs are of turtle-back construction. The coaches are of the open centre-gangway type with separate seats of the armchair pattern in the *de luxe* and combined double seats in the suburban coaches. This new rolling stock ranks among the most attractively finished and comfortable riding of any in use on American railways.

* * * *

Austrian 2-8-4 Express Locomotives

Two locomotives of the 2-8-4 type, one having two and the other three single-expansion cylinders, were introduced experimentally in 1929 for working heavy express passenger trains on the Austrian Federal Railways, and, as a consequence of the results therewith obtained, the two-cylinder arrangement was selected for incorporation in a new series of engines built at a later period. These locomotives are noteworthy for their large proportions. The cylinders, to which steam is distributed by poppet valves worked by Walschaerts gearing, measure 25·6 in. diameter by 28·4 in. stroke; coupled wheels, 6 ft. 4½ in. diameter; boiler pressure, 213 lb. per sq. in.; combined heating surface, 3,904 sq. ft.; grate area, 50·8 sq. ft. The engine develops a tractive force of 44,100 lb. at 85 per cent. of the boiler pressure, and weighs, together with the eight-wheeled tender, in working order 171 tons. All the engines are equipped with the Heinl feed water heating apparatus which has proved highly satisfactory in service. The illustration on page 982 was reproduced from a photograph kindly lent us by Mr. F. J. Kuretschka. It was taken at night by the aid of the lights of another locomotive standing on an adjacent track, and shows one of the engines at the West station, Vienna, at the head of a Vienna-Leipzig-Berlin international express.

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Rhodesia and Mashonaland Railways

THE separate reports for the year ended September 30, 1934, recently issued by Rhodesia Railways Limited and by the Mashonaland Railway Co. Ltd., the systems of which are operated by Rhodesia Railways Limited, reflect the all-round improvement in traffics, to which the continued expansion of the copper mines in Northern Rhodesia and the activity in the gold mining industry in Southern Rhodesia, have largely contributed. Gross revenue of the Rhodesia Railways for the year under review showed an improvement of £489,721 or 31·5 per cent. over the previous year. In working expenditure (including provision for depreciation and renewals) there was an increase of £104,651, and the surplus of gross revenue over working expenditure was accordingly greater by £385,070. After providing for debenture interest (and interest on deferred payments thereof) of £631,229 and other fixed charges there was a profit for the year of £23,684, compared with a loss of £244,471 in the previous year. Operating figures of the Rhodesia Railways are compared below:—

	1933–34	1932–33
Miles open	1,538	1,538
Train-miles	2,526,838	2,042,195
Passengers	407,349	375,815
Tons, general goods	576,411	452,535
Tons, minerals	943,483	665,122
Operating ratio, per cent.	70·1	85·5
	£	£
Passenger receipts	243,548	206,541
General goods receipts	1,015,392	740,023
Mineral receipts	600,730	432,399
Gross revenue	2,041,109	1,551,388
Working expenditure	1,430,481	1,325,830
Surplus	610,628	225,558

For the first five months of the present financial year net receipts show an approximate increase of £163,996.

Mashonaland Railway gross revenue was £267,547 higher than in 1932-33, when the revenue included payments of £71,669 from the Northern Rhodesia copper mining companies under guarantees in respect of branch lines to their mines up to September 30, 1932. Working expenditure increased by £80,522, due to the much larger volume of traffic carried, and the surplus was £187,025 greater. Operating figures are compared in the accompanying table:—

	1933–34	1932–33
Miles open	912	912
Train-miles	1,346,944	1,042,012
Passengers	216,401	226,006
Tons, general goods	457,143	398,048
Tons, minerals	702,247	442,007
Operating ratio, per cent.	70·7	82·1
	£	£
Passenger receipts	61,885	61,250
General goods receipts	499,378	334,309
Mineral receipts	582,195	376,820
Gross revenue	1,221,481	953,934
Expenditure	863,364	782,842
Surplus	358,117	171,092

After providing for debenture interest (and interest on deferred payments thereof) of £476,376 and other fixed charges there was a loss for the year ended September 30, 1934, of £57,989, as compared with a loss of £308,957 in the previous year. For the first five months of the present financial year there is an approximate increase in net receipts of £95,710. Both companies report that in view of the improved financial position their respective moratoria for the payment of debenture interest terminated on May 2, 1935. An agreement reached with the Governments concerned will enable the two companies gradually to build up and maintain out of rates a combined reserve equal to 2½ times the amount of their annual debenture service, which at present would be equivalent to £2,700,000. There is to be no reduction of existing rates for the purpose of producing a decreased total revenue so long as the amount standing to the credit of the combined reserve account is less than twice the amount required for the annual debenture service. Provision is also made for the gradual building up of a rates stabilisation account to a maximum of £500,000.

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Railways and Wagon User

THE railway companies have incurred a considerable expenditure in the provision of wagons and the financial results of their operation depend very largely upon the extent to which the vehicles can be fully utilised. In the case of wagons which have been built for the conveyance of exceptional traffics, such as explosives and heavy machinery, it is obviously very difficult to secure anything approaching the maximum user. The position is somewhat different in the case of the ordinary types of vehicles as the user can be more easily controlled in those cases where the companies are able to perform the loading and unloading services in addition to the actual conveyance service. Where, however, a trader's premises are situated on a private siding or he desires for any reason to undertake the loading or unloading operations, the incentive may well be lacking to carry out the work as expeditiously as the railway company. Any undue detention of wagons obviously reduces the revenue earning capacity of the line concerned, a position which has been recognised by the legislature for many years, as railways were long ago empowered to charge sums additional to the conveyance rate in respect of the undue detention of trucks, beyond a reasonable period, both before and after conveyance. Prior to 1913 a sum of 1s. 6d. a day was generally charged for the detention of ordinary wagons after certain reasonable free periods had elapsed. During the war, however, for a variety of reasons the undue detention of wagons increased substantially and, in connection with the general review of rates and charges which was undertaken by the Rates Advisory Committee, at the request of the Minister of Transport, the committee intimated on November 26, 1919, that it was satisfied that the detention of wagons was excessive and increasing.

In order to diminish the loss of user which the railway companies were experiencing it recommended that the detention of demurrage charge should be increased by 100 per cent. to 3s. a day, a sum which was considered to be appreciably less than the earning capacity of the wagon. This recommendation was implemented by the Minister in due course and the charge was increased to that figure. The power to make such detention charges was continued by Clause 11 of the Fifth Schedule to the Railways Act, 1921, and the charge of 3s. a day is still operative. While, generally speaking, excessive detention of wagons does not occur, the companies frequently experience difficulties in connection with seasonal traffics. For climatic reasons there is regularly a heavy concentration of traffic from abroad at the English ports due to twelve months' supply of material arriving within a comparatively short period. Steamers must be unloaded with the utmost possible despatch and the quantity of traffic which is unloaded into trucks is in some instances far in excess of that which the consignee can accept currently. This difficulty may arise through lack of accommodation at the consignee's premises or from the fact that the railway accommodation at the destination is insufficient to enable the company to deal promptly with such exceptional forwardings of traffic.

In either case the circumstances cause a considerable

number of vehicles to be rendered immobile for fairly lengthy periods. The railway companies thereby experience a potential loss of wagon earnings which might, of course, be materially reduced were they able to collect demurrage charges on vehicles so held. Unfortunately, however, their position is somewhat difficult as the majority of the companies have not hitherto charged demurrage on wagons held at intermediate points; indeed, the Court has maintained that one particular company was not entitled to charge demurrage when it was not able to place the traffic at the disposal of the consignee in consequence of accommodation not being available at destination. Moreover, in other cases, the railway companies themselves have been required to perform the loading and unloading services and any attempt to enforce demurrage on wagons held at intermediate points would doubtless create difficulties. Thus the traders are, in certain cases, securing the equivalent of free warehouse accommodation for extended periods, while the companies are losing the use of potential revenue earning units for protracted periods. As trade revives this consideration will become of increasing importance by reason of the greater demand for wagons which may be anticipated and, having regard to the necessity for reducing railway working costs, it would appear that this question might usefully be discussed with the traders concerned.

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G.W.R. Road Licence Appeal

THE decision in the case of the appeal by S. J. Norman and others against the grant by the Licensing Authority of the Western Traffic Area on May 9 of road licences to the Great Western Railway in Devon and Cornwall was made too late for us to comment upon it in last week's issue. The decision is formidably lengthy, consisting of 4,653 words, but may be summed up briefly as follows. The railway company's application, as published, embraced, as being required at Exeter and Plymouth, 76 and 60 vehicles respectively. At the hearing before the licensing authority the company explained that the actual allocation of the new vehicles for which licences were required involved 20 other stations in Devon and Cornwall, the adjustment in the published details being due to the fact that at the time when, according to the Act, they were called upon to make their applications, the exact distribution of the stock was not known. The objectors' representatives thereupon protested that they were not prepared to deal with the amended application and, by mutual consent, the hearing was adjourned, the revised allocation being handed over to the objectors with voluminous data shewing the grounds upon which the company desired to increase their equipment. At the adjourned hearing the applications, as amended, were contested, and after what was stated by the licensing authority to be cross examination of unique severity the company's evidence remained untouched and the licences asked for were granted. It should be added that, in publishing its decision, the licensing authority granted the licences as applied for at Exeter and Plymouth and not as amended to cover the 20 other stations.

Appeals were lodged against the decisions, the main ground being that the licensing authority was not justified in granting licences for vehicles at the Exeter and Plymouth bases on the strength of evidence designed to show the necessity of such vehicles at places other than Exeter and Plymouth, the Act stipulating that "a separate application must be made in respect of each such base or centre." The appeals tribunal, notwithstanding the mutual agreement come to locally, held that the terms of the Act had not been complied with and that where licences had been granted, notwithstanding the absence of a formal application naming the specific base, they were disallowed. At the same time the tribunal decided that "the respondents had discharged the onus on them of proving that collection and delivery to and from the various bases could be better co-ordinated at those bases with the railway services and could be carried out more efficiently by the railway company with vehicles owned by them and under their control, than by their employing other operators to do the work." It requires to be added only that three whole days were devoted to the company's application in the licensing courts in the West of England and that the hearing of the appeal involved an additional six days.

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Austrian Railway History

TOMORROW (Saturday) a party of members of the Institute of Transport is leaving for a tour of Austria, where a comprehensive programme of visits to places of technical interest has been arranged. Post-war Austrian transport is faced with many peculiar, and in some respects unprecedented, problems as the result of the splitting-up of the Austro-Hungarian Empire. Its capital city is unduly large for the present territory of but 32,175 square miles, and this city contains about 1,900,000 of the country's total population of 6,700,000. Moreover, the paucity of mineral wealth, in particular the absence of coal, has resulted in extended use of electricity. The energetic methods adopted to overcome the great disadvantages resulting from the disruption of the Empire, however, combined with the great natural beauty of the country, and its historical interest as the great centre of eighteenth and nineteenth century Continental politics, make Austria a country of outstanding interest for the purposes of the Institute of Transport's summer tour. The historical museum of the Austrian Railways, opened in Vienna over forty years ago, offers a fairly compact and complete picture of the development of the railways in Austrian territory from their earliest days down to the present time. The collection is housed in the halls of the Industrial and Crafts Museum and has recently been enriched by two memorials which call to mind the most interesting and significant steps in the process of development—namely, a map made in 1811 of the first practical railway proposal in Austria, and a model of the pioneer Semmering locomotive, *Karpellen*.

For centuries there was an active traffic between the Danube and the Moldau, principally in salt, since this essential article of common consumption was not found in Bohemia, a country otherwise rich in natural products. Transported in casks from Salzkammergut, along the Traun and the Danube and stored in warehouses along the towns on the banks of the latter, large quantities of salt were conveyed yearly from Budweis along the Moldau. From Passau there was a bridle path, called the Golden Way, leading through the swamps of the wooded parts of Bohemia to the Moldau and the extent of the traffic along it is evidenced by the great number of animals' shoes which have been found imbedded in the ground there. Later, the route followed was the Royal and Imperial Highway, a somewhat inadequate turnpike, which went from Mauthausen and Linz to Budweis. Many hundred four-horsed vehicles had to be employed on this road, with its many ups and downs, to keep the stock of salt at the required level at the transhipping point on the Moldau; the journey there and back occupied five to six days. These difficulties gave rise to a proposal to construct a

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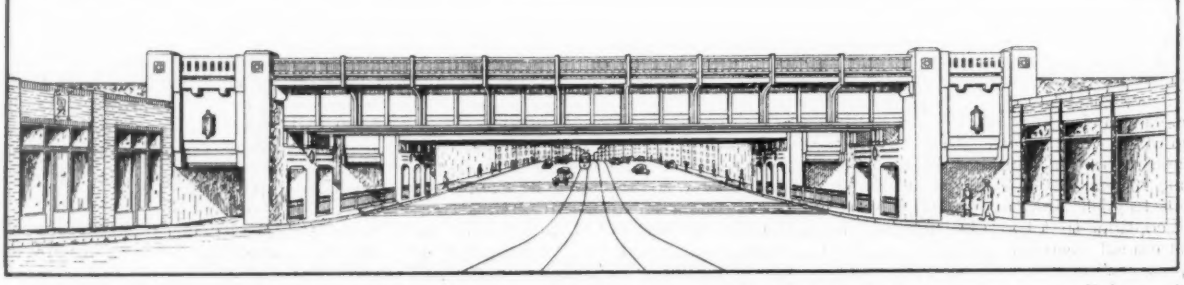
waterway connecting the Traun and the Danube with the Moldau, which possessed the additional advantage of connecting the latter river with the Elbe Valley and so forming a link in water communication extending from the Black Sea to the North Sea. Emperor Karl IV, always seeking to forward the interests of his native Bohemia, is said to have occupied himself with such a plan, but he died in 1378, not without leaving a scheme for a waterway in the vicinity of the Golden Way. Wallenstein, the great general of the 30 Years War, wished, as a true son of Bohemia, to make the rivers of his native land navigable at his own expense, and build a canal connecting the Elbe with the Danube. At the beginning of the nineteenth century increasing trade resulted in the problem of improved transport being taken in hand as a matter of urgency and various plans were examined by Dr. F. J. von Gerstner. He was too busy to undertake construction work himself, but his son secured a concession for a Moldau-Danube railway on the lines the father advocated. This Linz-Budweis horse railway carried the traffic between the Moldau and Danube for forty years and remained the only horse-worked line long after the advent of the steam locomotive. In the Austrian Railway Museum the map of the Linz-Budweis Railway already referred to may be seen. The history of this line is briefly outlined on page 972.

Soon after the steam railway had found its way to Continental countries, British engineers considered that locomotives were not suitable for use in mountain districts, and, in consequence, rope and other methods of traction were used where steep inclines occurred. In Austria the new system of transport was soon welcomed and the State, with great foresight, entered the field with a plan for a general railway system. In the flat country north and south of Vienna a start had been made, for the creation of the most difficult part of this network, that leading over the 981-m. Semmering Pass towards Trieste, which had been entrusted to an eminent engineer, Dr. Phil. Karl Ritter von Ghega, and, on account of the great difficulty of the problem, he had been sent to North America to study railways there. Locomotives were in use in that country on steep inclines. Ghega was convinced of their practicability, and believed that a locomotive could be made to meet the special circumstances on the Semmering Railway, a line which was opened on July 17, 1854, and remains as a monument to his genius. The Government offered a first prize of 20,000 "full-value royal ducats" for the best locomotive. Four engines, two Austrian, a Bavarian and a Belgian were submitted for trials. Probably they all met the specified requirements, but none appeared really suitable for regular service on the Semmering line. The first prize was, however, given to the *Bavaria*. The Government then instructed Wilhelm Freiherr von Engerth, engineer in the Mechanical Department of the Ministry of Trade, to prepare a design for a really suitable engine for mountain work, which he did, using the experience gained in the trials. He produced a locomotive of larger dimensions than usual up till then, with the engine portion so connected to the tender that it could negotiate the very sharp curves encountered. In order to use the weight of the tender, Engerth installed, on some of the first locomotives, a spur gearing arrangement connecting the six coupled locomotive wheels with the tender wheels, likewise coupled, but this did not work successfully. Dr. Karl Gölsdorf, the eminent engineer of the Railway Ministry, introduced in 1900 a successful Decapod locomotive, Class 180, for working this line. The first of these is to be put in the museum as a memorial. Traffic was begun with 26 Engerth locomotives. The first was the *Kapellen*, made by the Esslingen Works, Württemberg, which worked up to 1928, but was then so much altered from its original state that it was not practicable to preserve it as a relic. The cost of converting it to its original condition would have been excessive. In order to have at least a model of this memorable engine, a partly finished one, to a scale of 1:10, was presented by the former Südbahn Company, and altered and completed according to the available plans to be in all respects a faithful reproduction of the original. This is now in the museum at Vienna.

AN AMERICAN BRIDGE

Perhaps the respective spheres of engineering and architecture seem most in opposition when they meet at a railway bridge crossing a main street. If the engineer leaves his bridge as a plain unvarnished (though painted) tale in steel, artistic criticism is apt to be adverse; if he provides it with his own architectural dressing the criticism becomes louder, and the result is decried as "engineery architecture." Our American friends have had to meet this situation in building two railway bridges over the 90-ft. carriage way of Woodward Avenue, Detroit. We reproduce below from an American contemporary, a drawing showing one of the bridges, from which it will be seen that it was decided to build a plate girder bridge, and a plate girder bridge it is, embellished only by a patterned and projecting footway along the top. Apart from that feature, the structure does not pretend to be anything but a plate girder bridge expressed in the simplest engineering terms, and simplicity has a way of disarming criticism. Our own similar bridges are nothing to boast about; this one at Detroit is a very satisfactory example, until it dresses itself in architectural clothing on passing over the pavement.



New plate girder bridges carrying railway over road at Detroit, U.S.A.
(Reproduced by courtesy of "Engineering News Record")

PUBLICATIONS RECEIVED

McGraw Transit Directory. Formerly McGraw Electric Railway Directory. 1934. New York: McGraw-Hill Publishing Co. Ltd., 330, West 42nd Street. 8¼ in. × 4½ in. 187 pp. Price $15.00 net.—For many years past the "McGraw Electric Railway Directory" has been recognised as an indispensable volume to those concerned with electric railways, interurban lines, and street tramways on the North American continent. With the current issue the McGraw Transit Directory is enlarged in scope so as to include trolleybus and omnibus operations. So far as the U.S.A. is concerned, these are listed for every community with a population of more than 25,000, but smaller towns are included usually on the basis of having either local tramways or motorbus companies as successors of tramways. Another new feature introduced with the current edition is a statistical section, including tables and charts, showing the extent of the industry, track and route miles, size of fleets, and legislative restrictions. The directory retains its long, thin shape suitable for pocket use, and includes in 187 pages printed on thin paper a quantity of information which constitutes a masterpiece of compression.

Metallic Arc Welding. By H. Harris, Ph.D., D.I.C., A.R.C.S. London: Edward Arnold & Company. 9¼ in. × 6 in. 199 pp. Illustrated. Price 16s. net.—This is a book for the metallurgical engineer and the student. The author assumes in his readers a working knowledge of physics and physical metallurgy. On this foundation he outlines the results of recent investigation in the laboratory and in the field, reviewing informed opinion on such complex questions as stress relieving, the age-hardening of weld metal, and the economic uses of arc welding. The first six chapters outline the mechanism of arc welding, the choice of electrodes, the effects of welding upon deposited metal and upon the stock. After a brief glance at welding plant, the author passes to the testing of welded products and thence to a well-balanced account of the influence of oxygen and nitrogen on the structure and properties of weld metal, and associated problems of ageing. Chapters 12 to 17 are devoted to the weldability of a wide range of steels and non-ferrous alloys. This concludes the more technical treatment. At the end of every chapter in the book except one, a list is given of the researches and other works referred to in the text. These references number 168, of which some 70 per cent. are American, 25 per cent. English, and 5 per cent. German. We consider that the ratio between the first-named two is probably a fair representation of the respective contributions of these countries to the study of fusion welding, but we are not satisfied that the share of German engineers may be written off at 5 per cent. Though this book is, in fact, largely a mirror of American practice, we would point out that, apart from the lack of balance above implied, we feel that none of Mr. Harris's readers who study him thoroughly will have reason to quarrel with his approach. The author brings a discerning mind to the discussion of his problems, which should do much to reform opinions moulded by the numerous misleading tags of information current regarding welding practice here and abroad. The style throughout will be largely intelligible even to those who may not be theoretically equipped to read this type of work.

The last five chapters illustrate applications of arc welding, with a strong bias towards the construction of pressure vessels for steam raising and for the chemical industry. We consider that structural engineering is here neglected in the illustrations, and that engineers would prefer to know less about demolition bombs and more about rail welding than can be told in 10 lines. On the whole, however, this is a satisfying book. There is not a single line of irrelevant matter in it. The reproductions of photographs, particularly the microphotographs, are at times little short of exquisite.

Speed, Space and Time. By Vernon Sommerfield. London: Thomas Nelson & Sons Ltd., 35-36, Paternoster Row, E.C.4. 8¼ in. by 5¾ in. by 1½ in. 299 pp. Illustrated. Price 7s. 6d.—Developments in rapid transit have followed one another with such bewildering frequency during the past few years that books written but five years ago are already out of date so far as the "records" and other maximum achievements are concerned. Mr. Sommerfield has prepared this volume for popular consumption by those who require a semi-technical narrative. Unfortunately the author is not always accurate, and we cannot escape feeling that insufficient care has been given to the preparation of the volume when we find that the frontispiece is called the Flying Hamburger but is obviously not that famous train, and appears to be a single unit railcar of the Kruckenberg type. Nevertheless, the volume makes very good reading and is thoroughly up to date. It is generously illustrated with photographic reproductions on separate plates, and also has a number of line drawings interspersed throughout the text.

Booklets from the P.L.M.—We have received from the Paris, Lyons & Mediterranean Railway a series of illustrated folders dealing with the attractions to the tourist of Corsica, Savoy, the Rhone Valley, and the Alpine region of the Dauphiné. Each has a map, and contains brief notes on the principle centres of interest. The pictorial value of the publications is enhanced by the tints chosen for the many striking and beautiful views. Another folder enumerates the medicinal qualities and recreational possibilities of the spas served by the P.L.M. system. This intersperses with more orthodox scenes a lively selection of humorous sketches showing that "taking the waters" is by no means the solemn business it was in the days when it first became fashionable. A timetable of the P.L.M. road motor services has also been issued by the company in a convenient form for the pocket. As well as motor-bus and long-distance coach services in France and Corsica, it gives fares and details of round trips operated from seaside and inland resorts, schedules of mountain railway and road services connecting with the P.L.M., and sailings between France and Corsica.

Lamps for Decorations and Floodlighting.—Cosmos lamps, manufactured by the Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, are available in a wide range of colours and patterns suitable for decorative purposes. These are listed in a new illustrated catalogue, which also shows suitable holders for use in building up outdoor displays and complete outfits for indoor use. A series of coloured tubular lamps holds many possibilities for the artistic adornment of large buildings. Floodlighting equipment for electric discharge or high-wattage gas-filled lamps is also listed.

Bronze Castings.—David Brown & Sons (Hudd.) Ltd., Huddersfield, has issued a handsomely produced booklet dealing with the composition, properties, manufacture, and application of bronze castings. It is copiously illustrated and printed on art paper, and the pages giving specifications of the firm's Taurus bronze castings are preceded by a section which summarises the history and practice of founding the metal. After describing the centrifugal casting process developed for the production of Taurus products, the careful selection of raw materials is emphasised, and the reader is given some useful hints regarding the purchase of bronze castings

Some Notes on Alloy Steels.—Much vital information regarding the production and qualities of alloy steels is contained in expensive text books to which reference is not always easy or convenient. The purpose of this booklet, published by Samuel Fox & Co. Ltd., Stockbridge Works, near Sheffield, is therefore to present such important material in a compact and readable form. Its scope covers manufacturing processes, heat treatment, and the influence of alloying elements on the physical properties of steels. A detailed discussion follows of structural alloy steels as applied to drawgear and locomotive connecting rods, and of nickel steel as a substitute for wrought iron. Weather resisting and stainless steels are also dealt with in this very lucid and well-arranged publication.

XUM

THE SCRAP HEAP

Wireless has succeeded in bringing people closer together, says a scientist. So have the Underground railway trains.—*From "Punch."*

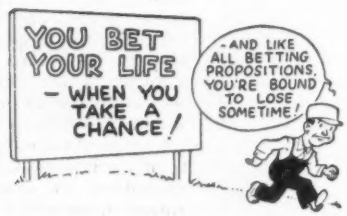
* * *

51 YEARS A SEASON TICKET HOLDER

Without a break Mrs. M. Bennett, of Sheffield Road, Dronfield (Derbyshire), held a season ticket over the L.M.S.R. between Dronfield and Chesterfield for 51 years. She has just relinquished her ticket as she now travels less frequently, but it is estimated that since she took out her first season in 1884 she has travelled some 125,000 miles as a season ticket holder.

* * *

This Is No Joke



A telling tailpiece from "The Mutual Magazine," issued by the Mutual Beneficial Association of Pennsylvania Railroad Employees

* * *

"When travelling by train I often count the cows from the window," said the little man in the corner seat. "It helps to pass the time away."

"Seems impossible at this speed," said his fellow-passenger. "We are approaching one of my fields and I know exactly how many cows are there; count them."

Soon the human adding machine got to work. "Forty-three," he announced.

"Absolutely right," remarked the other. "You are a marvel; I don't know how you do it."

"Easy. I just count the legs and divide by four."—*From "The Deputy" in "The Financial Times."*

* * *

A FISHY STORY FROM THE FOOTPLATE

Recently, when the Shellal-Cairo express was passing through a certain station in Upper Egypt, the fireman, as usual, put out his arm to receive the cane hoop carrying the staff, and on his arm passing through it he was nearly dragged off the footplate. Fortunately the chain was fixed between the engine and tender. On pulling in the staff he found a piece of stiff wire attached to it to which was secured a large Nile perch, addressed to the stationmaster of a neighbouring station at which the express stopped. Although this method of transporting perishables is new to us, and has not, we understand, been officially recognised by the Goods Department, it certainly does not lack originality. The donor evidently wanted his gift to arrive at its destination in a "tender" condition.

* * *

AN AGREED CHARGE

A railway guard, living in a village near Warsaw, was due to retire on pension, and planned to spend his old age on a little farm. His wife, however (says Reuters) was reluctant to leave and eventually the guard found that she had a lover in the town. Seeking him out, the guard offered to divorce his wife—if he were given "compensation." The lover agreed, and the wife was handed over for £80 and two cows.

* * *

ARCHÆOLOGY AND THE "REICHSAUTOBAHNEN"

The construction of the new national motor roads, or *Reichsautobahnen* in Germany has resulted in the discovery of quite a number of interesting objects, dating from very ancient times in some cases. This has occurred, for example, on the route between Liegnitz and Breslau, where valuable items have been found in some fourteen localities. They comprise a variety of articles in flint, bronze, iron, and earthenware, representing almost every period in nearly uninterrupted order from about 4000 B.C. Some are in an excellent condition, to judge from the illustrations in *Die Reichsbahn*, and will form an important addition to the present national collections. Some of the discoveries are believed to throw light on hitherto disputed points concerning the movements of early peoples in Silesia and the neighbouring districts and hence to possess a definite archæological value. Of the more recent centuries, of course, more developed remains have been unearthed, including parts of dwellings. No doubt there will be similar discoveries along the new roads in other parts of Germany.

* * *

We have received the following statistical comparisons from the Swiss Federal Railways: "If the services of the Swiss Federal Railways were spread evenly over the whole year on one line, running from Berne to Jerusalem, a train would be leaving every 42 minutes all the year round. There would continually be 136 trains under way, with 7,296 passengers and 4,936 tons of freight."

* * *

In connection with the visit of the Fleet to the Thames, the Southern Railway ran special excursions at cheap fares to All-Hallows-on-Sea on Wednesday last, May 15. A special late train was run from All-Hallows-on-Sea at 10 p.m., in order to enable visitors to remain and see the Fleet illuminated.

* * *

5,800 PERSONS MISSING

In connection with the Silver Jubilee celebrations one of the four group railways ran a special excursion to London from a provincial town not so far distant. No fewer than 6,000 persons travelled to London, but up till now only 200 have returned—at least that is so far as the railway can tell!

To MATTHEW KIRTLEY, Esq.,

Superintendent of the Locomotive Department,

MIDLAND RAILWAY, DERBY.

Sir,

We, the Employees of the Midland Railway Company, desire to express our deep gratitude to you for the great and unvarying kindness and consideration which you have ever displayed in all that relates to the convenience, comfort, and privileges of the various grades of men serving under you; kindness, manifested not in isolated and remote instances, but uniformly and without intermission.

You have now, Sir, been the Head of the Locomotive Department for more than a quarter of a century, and during the whole of that extensive period we rejoice to remember that there has never been a serious dispute or difference between us; for whenever we have had a complaint to offer, or a favour to solicit, we have not been met with cutting rebukes or harsh denials, but with a dignity, a generosity, and an appreciative sympathy that has won our highest regard and truest respect. And we heartily congratulate ourselves upon having at our head a Gentleman of such practical wisdom, enlarged experience, courteous demeanour, and broad sympathies; and that the period of your Superintendence has been marked by such steady, continuous, and rapid development and prosperity of the Company's business.

In the important matter which has brought us here to-day, a matter deeply affecting us both in our health, our domestic comfort, and our social and mental improvement, we know that you have been our sincere, disinterested, and earnest friend; and we know that you will still support our cause with all the weight and authority of your office and character.

To the Board of Directors our sincere and hearty thanks are also due for their kindness in granting us a reduction of the hours of labour; and we earnestly hope that as they have generously acceded to our request for shorter hours, they will not mar their gift with a condition that would practically make it almost valueless to us, and be in effect offering a premium for indolence and sloth; and that is, asking us to commence work at 6 o'clock on Monday morning. Some of us wish to attend the Evening Art and Science Classes, and others to improve themselves by reading and study, and these aims and objects would be far better served by our working the time as we requested, namely, from 6 a.m., until 5 p.m.

We therefore trust that the Board of Directors will see fit to grant our request, and that you, Sir, will kindly be our friend and spokesman for that purpose.

And now, Sir, wishing you, together with your beloved Wife and Family, health and prosperity, thanking you for all past kindness, and trusting that our future relations may be as happy and agreeable as the past,

We subscribe ourselves,

Your humble and obedient Servants,

Signed in behalf of the whole of the Workmen.

WILLIAM BILSON, Erector.	CHARLES RILEY, Turner.
ROBERT HILLIARD, Fitter.	WILLOWS WRIGHT, Spring Smith.
JOHN BOOTH, Erector.	JOHN GADSBY, Millwright.
JOHN ALLCOCK, Erector.	JOHN SMITH, Carriage Department
ABRAHAM BAILEY, Erector.	JOHN BANCROFT.
WILLIAM NORMAN, Smith.	JOHN FORD.
JOHN R. TETLEY, Joiner.	GEO. THOMPSON.
JOHN MATTHEWS, Boiler Maker.	WILLIAM ILLSLEY.

A Derby correspondent has sent us the above memorial addressed in 1869 *to Matthew Kirtley, then Locomotive Superintendent of the Midland Railway, an office he held from the formation of the company in* 1844 *until his death on May* 24, 1873

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

BRAZIL

Viação Ferrea do Rio Grande do Sul

The construction of the 70-km. "cut-off" between Barreto and Gravatahy, on the main Porto Alegre—Santa Maria line, for which Gruen & Bilfinger of São Paulo are the contractors, is going ahead rapidly. The less important earthworks are already finished, the bulk of the masonry work of the 55 girder bridges is ready and the erection of the spans has in some cases begun. Early in February the first reinforced concrete pile was driven as part of the foundations of the 352-m. bridge spanning the river Cahy. Already 14 km. of track have been laid and it is hoped that the "cut-off" will be opened to traffic in February, 1936.

Paulista Railway Extension

The extension to Pompeia of the line which runs from Itirapina to Marilia through Dous Corregos and Agudos was sanctioned in October, 1933, and construction was begun in November of the same year, while in the middle of February, 1935, this 31-km. length of line was opened to traffic: it serves a fertile zone in the State of São Paulo lying between the valleys of the Rio Aguapehy and the Rio do Peixe. There are two intermediate stations, Padre Nobrega and Oriente, and the daily service consists of a local passenger train in each direction and a through night train to and from Itirapina, Rio Claro, Campinas, and São Paulo.

Central of Brazil Railway Electrification Contract

The electrification contract referred to in our *Electric Railway Traction Supplement* of May 3, was signed by Snr. Marques dos Reis, Minister of Transport and Public Works, and Mr. Henry Walter Foy, the General Manager of the Metropolitan-Vickers concern in Brazil, on March 14, in the office of the Minister of Transport. Among those present at the ceremony were the Acting Minister of Finance, Snr. Bellens de Almeida; the ex-Minister of Transport, Snr. José Americo de Almeida; the Director of the Central Railway, Col. Mendonça Lima; engineers and representatives of the contracting parties and members of the press. After short speeches by the signatories, the Finance Minister signed the 49 certificates which are to remain in the Bank of Brazil to guarantee payment for the work in accordance with the terms of the contract.

As regards the supply of power, three companies have already submitted tenders:—The Rio de Janeiro Tramway, Light & Power Company; Consorcio Italiano de Electrificação, and Compãnhia Vera Cruz. The Superintendent of Electrification has asked for official instructions with regard to the examination of these tenders.

Serious Level-crossing Accident

On March 13, one of the worst level-crossing disasters recorded in the country occurred on the broad gauge lines of the Central Railway. The night train from São Paulo, due at Rio at 7 a.m., came into collision with a motor bus, which had disregarded the crossing keeper's red flag, and run on to the crossing. The bus, which had seats for 20 passengers, was carrying 33, eight of whom were killed and 16 injured. This accident may bring to a head this habitual overloading, which is due to the bus drivers receiving bonuses for the number of passengers carried each day: This also encourages speeding. The accident will also emphasise the fact that this particular crossing is situated on a curve with thick foliage on either side limiting the range of vision of enginemen and road-vehicle drivers alike, and is entirely unprotected by barriers, warning signs or lights, reliance having to be placed on red hand-signals displayed by crossing-keepers.

INDIA

Government Inspectors' Reports on Certain Accidents

A small publication has been issued by the Railway Board reproducing the reports by the Government Inspectors of Railways of inquiries into certain accidents that occurred during the half year ended September 30, 1934. One report, however, relates to an accident during the previous half year, in which the up East Indian Railway Bombay mail was derailed between Ganjkhwaja and Moghal Serai on October 26, 1933. The Government Inspector is of opinion that the train was travelling over a curve at high speed and, as the track was not maintained at a sufficiently high standard to resist the lurching which the "XB"—the second or medium size Indian standard 4-6-2 type—engine develops at high speed, the rails became distorted. He does not hold any one directly responsible for the accident, but as the track is laid with only 88½-lb. bull-headed rails it is barely able to withstand the lurching of this type of engine, even if maintained to a 100 per cent. standard of efficiency, and there is, therefore, no factor of safety, so that it is quite possible for other accidents to occur in similar circumstances. He recommends that the possibility of reducing the lurching tendency of "XB"-type engines be further investigated and suggests that in the meantime it is inadvisable to put any more of this type of engine into service on this weight of track. He also recommends that special observations be made into the running of "XB" engines over track laid with 90-lb. rails.

The derailment of a passenger train on the Raipur-Vizianagram section of the B.-N. Railway in September, 1934, causing the death of nine persons and also several injuries, was found to be due to the train running into a breach which had occurred at such a time and with such rapidity as to render the chances of its early detection or the prevention of the accident extremely remote.

SOUTH AFRICA

Housing Accommodation Investigation

It has been decided to undertake a comprehensive investigation of the housing accommodation of railway and harbour servants. The investigation will be conducted by two of the administration's senior officials, and the scope of their inquiry will include the adequacy or otherwise of housing available in the towns, townships and railway depôts; the extent of the housing shortage, if any, in the different localities; the extent to which municipalities and other local authorities are prepared to provide additional houses in areas where railway servants are unable to secure suitable houses within their means. Consideration will also be given to the question of whether the administration should build additional houses so as to ensure reasonable living conditions, and if so, what building is necessary immediately and what may be spread over a period of years. Living conditions in railway camps and the condition of existing railway and harbour quarters will be studied and consideration will be given to the type, or types, of houses which are most suitable for and should be built in different localities.

Financial Position: Satisfactory Improvement Continues

The accounts for the month of February show a surplus of revenue over expenditure of £205,706, bringing the surplus for the eleven months April, 1934, to February, 1935, up to £3,037,666. After deducting the accumulated deficit of £2,168,269 and allowing for a contribution of £767,250 to betterment, pensions and superannuation funds, there remains a surplus of £869,397. The earnings from transportation services only for the eleven months totalled £24,625,208, an increase of £2,930,335 over the corresponding period of the previous

year. Railway working expenditure totalled £16,667,843, an increase of £1,290,571.

EGYPT

The Report of Sir Felix Pole

The report of Sir Felix Pole, dealing with certain important questions on the Egyptian State Railways, has now been received.

The questions under review are:—(*a*) The proposed transfer of the whole locomotive workshops to Abu-Za'bal and the evacuation of Bulak, (*b*) The separation of the Egyptian State Railways, Telegraphs and Telephones finance from that of the State, (*c*) Types of future rolling stock, (*d*) electrification of suburban lines. In addition to these, Sir Felix Pole has made a few observations on the question of co-ordination of transport facilities generally.

Regarding (*a*), Sir Felix Pole recommends that the whole of the locomotive repair work should be transferred from Bulak to Abu-Za'bal as quickly as possible, and that the foundry and carriage repair works should also be transferred at the earliest date. He considers that the present division of the workshop staff is undesirable from many points of view, that the time of the supervisory staff is not used adequately and that the workmen lose time in travelling between Cairo and Abu-Za'bal. In this latter connection he urges that the housing scheme should be pressed to an early conclusion and that the village should be made attractive for the workmen by providing a school, a mosque, shops, sanitary arrangements, playing grounds, &c.

Regarding (*b*), the report strongly recommends the separation of Railways, Telegraphs, and Telephones finance from that of the State. This, Sir Felix considers, should be regarded as the first move in a scheme designed to permit of the railways being run to commercial principles unhampered by State control. With regard to the Government's return on the assumed capital of the railways, namely, £E.26,000,000 he suggests that half the capital should be regarded as preference capital on which interest should be paid at the rate of 4 or 5 per cent. per annum. The other half should be regarded as ordinary capital, the return on which would fluctuate with the fortunes of the railway.

Electrification Recommendations

Concerning (*d*), he considers that the introduction of light units on branch lines and certain sections of main line where the traffic is light, is in accordance with modern practice and should be given a trial before a final decision is taken upon the subject of electrification. Continuing, he deals fully with the advantages to be derived from the electrification of suburban lines and recommends that since full details have been prepared for the electrification of the Cairo-Helwan line, the complete electrification of the line should be authorised forthwith. The section Saida-Zenab should be doubled and located below street level thus abolishing the three level crossings. The second stage of development should be the electrification of the Cairo-Matariya Railway.

Concurrently with electrification of the Cairo-Helwan line, alternative schemes should be prepared for connecting the Helwan and Matariya lines either on the cut-and-cover principle, or by a tube railway approximately in a direct line between Bab El-Louk and Pont-Limoun, or by an elevated railway, though Sir Felix does not recommend this last alternative as it would detract from the general amenities of the city.

Traffic Co-ordination

In dealing with the question of co-ordination of transport facilities, he considers that the Government would be well advised to decide upon a comprehensive policy of co-ordination of transport. He suggests, briefly, that transport for hire, whether by rail, road, air, or water ways should be vested in the State and rights of operating the various systems delegated to one or more companies. A transport co-ordination board should be formed by the Ministry of Communications, representing the Ministry of Communications, the Ministry of the Interior, the Ministry of Commerce and Industry, the railway administration, the light railways, the road and transport industry, the internal waterways and the commercial community.

The duty of the board would be to co-ordinate the operation and development of all forms of transport to meet the economic needs and conditions of the country, to eliminate uneconomical working, to approve or adjust fares and rates for similar services and to authorise schemes for pooling receipts. There would be an appeal board to which appeals against decisions of the transport co-ordination board would be referred.

NEW ZEALAND

Bold Improvement Policy

The Government Railways Board, encouraged by an improvement in net revenue of £230,000 during the last two years—despite partial restoration of wage and rent cuts to the employees—carried through a bold improvement policy in maintenance of track construction and railway stock, costing an additional £156,000 during the year ended March 31 last. The Chairman, Mr. H. H. Sterling, C.M.G., in a recent review commented on the gratifying feature of passenger traffic improvement. "This," he said, "seems to justify the policy of the board in reducing fares and undertaking various special excursions which had been a very material factor not only in improving the financial position, but also in developing the habit of travelling by rail among the public generally."

New North Island East Coast Line

The completion of the new line between Napier and Gisborne (145 miles), previously referred to in these columns, is being strongly urged at present by the local bodies in the area concerned. Six months ago the committees representing the northern and southern portions of the line decided to hold the matter over for some months pending the result of negotiations which were to be carried out in England, but an early decision is now expected. Meanwhile a project for completing the railway as far as Waikokopu from Napier at an estimated cost of £100,000, is being considered. This work would not only provide constructive work for many men who are at present engaged on tasks of less importance, but would also greatly improve the outlook for many farmers in the isolated districts. It would also serve to open up a large area of land which at the present time is responsible for a far smaller return than would be the case under a system of closer settlement and higher development which would be made possible by the advent of a railway. The district committees are now making further representations to the Government.

CHINA

Various Events on April 1

April 1 was marked by the inauguration of a new through train service between Peiping and Tsingtao, which is now running over the Peiping-Tsinan section of the Peiping-Shanghai and the Tsinan-Kiaochow Railway. On the same date the doubling of the Shanghai-Nanking section of the Nanking-Shanghai Railway was to have been ready for service. Also on April 1, a trial run with a goods train over the new 98-km. Nanking-Wuhu Railway was to have been made. The regular service over this line was expected to be inaugurated in the middle of April.

Lung-Hai Railway Developments

The first two wharves at the new port of Lienyunkang, the eastern terminus of the Lung-Hai railway, have now been completed. The first is capable of berthing three 3,000-ton steamers and the second is in use for coaling. The railway is arranging to equip the port with a new 1,000 kW. electric plant and, in addition, more cranes for handling cargo. The estimated cost of the port is $2,000,000.

Reports from this railway indicate that orders to the value of $3,300,000 have been placed in Europe by the administration for steel rolling stock, which is required mainly for use between Hsuchow and Sian, the present terminus of the western extension of the Lung-Hai main line. It is also reported that some passenger locomotives are to be ordered shortly.

OUR CENTENARY—MESSAGES FROM READERS

As announced in our May 3 issue, "The Railway Gazette" and the journals incorporated with it have completed 100 years of continuous publication

ON this and the following pages we publish a second instalment of the many messages we have received in connection with the centenary of THE RAILWAY GAZETTE and the various railway journals now incorporated with it, the earliest of which made its first appearance on May 1, 1835. In expressing our thanks to all who have written, may we say how greatly we value their appreciative and encouraging messages. We assure them that they will not make us conceited; in fact, already they have had an opposite effect, having aroused a certain sense of apprehension as to whether in the years which we hope are before us THE RAILWAY GAZETTE will continue to earn the regard of its readers to the same extent.

Mr. S. J. Hungerford, President, Canadian National Railways, Montreal.

To have completed a century of service in the interest of transportation is an achievement of which THE RAILWAY GAZETTE and associated journals may be justly proud. May I tender my sincere congratulations and best wishes for continued success.

Mr. H. L. Thornhill, Chief Legal Adviser, London Midland & Scottish Railway Company.

May I add my congratulations to those which have already been expressed by many of my railway colleagues upon the Centenary of your admirable journal. Among the many literary dishes which are laid out upon my office table for consumption I always regard THE RAILWAY GAZETTE as a *bonne bouche*. It tickles my palate and leaves my digestion unimpaired. With all good wishes for the future.

Mr. G. Marshall, Goods Manager (Southern Area), London & North Eastern Railway.

To be holding the position of Editor of a Journal of the character of THE RAILWAY GAZETTE at the time when it achieves the distinction of having completed 100 years of continuous publication is something which is doubtless causing you a feeling of considerable gratification. I would like to offer to you and your Journal very hearty congratulations with my very best wishes for the continuance of your usefulness.

Mr. A. D. Jones, Locomotive Running Superintendent, Southern Railway.

THE RAILWAY GAZETTE is especially valuable as an accurate history of railway development; and, in these days of far-reaching changes in methods of transport of all kinds, it is of great interest to have such a complete record extending over 100 years. I should like to add my congratulations on your centenary, and my best wishes for continued prosperity.

Mr. H. F. D. Page, Assistant Signal Engineer, Great Western Railway, Reading.

I was not aware until I saw the GAZETTE for last week that it was your Centenary. I had no idea in fact that you were such an ancient institution, and appear to have beaten the Great Western by a short head.

I cannot let the occasion pass without adding my hearty congratulations and by saying that from the Signal Engineer's point of view the information appearing from time to time on signalling matters cannot but be valued and appreciated by all those engaged in the signalling profession.

Mr. J. G. Robinson, C.B.E., formerly Chief Mechanical Engineer, Great Central Railway.

It is my privilege to join with others in congratulating THE RAILWAY GAZETTE on the completion of 100 years' publication. I have been a constant reader of your GAZETTE for over 30 years, and it has added greatly to my pleasure, especially since my retirement from the railway service. I congratulate all who have taken part in the production of this journal, which always contains so much useful information of the progress made in engineering, which all engineers know has no finality.

Mr. H. Marriott, C.B.E., formerly Assistant to General Manager, London Midland & Scottish Railway, and previously Chief Goods Manager, Lancashire & Yorkshire Railway.

Your Centenary Number is most interesting and I heartily congratulate you on the work you have done in bringing THE RAILWAY GAZETTE to its present position. I am particularly struck with your Chart. You have every reason to be proud of what has been done since Mr. Boardman came to England in the early 1900's—I well remember his visit to see Mr. Aspinall in Manchester about that time, and your appointment as Editor of the enlarged paper.

Since that time THE RAILWAY GAZETTE has forged ahead, and has been most useful to railway officers at home and abroad, not only as a record of current railway events by its excellent editorials and personal news, but also in a marked degree by the lucidity of the technical articles (so well illustrated) on all forms of transport and engineering development.

The extent of the attractive advertisement section of the GAZETTE week by week bears convincing testimony to the value placed by manufacturers and others on your journal as a medium for publicity. May THE RAILWAY GAZETTE and all concerned in its issue continue to prosper!

Mr. H. R. Campfield, formerly Divisional Superintendent, Great Western Railway, Paddington.

Please accept my hearty congratulations upon the Centenary of your GAZETTE, and I consider it a great achievement for you to have arranged for it to coincide with the centenary of the Great Western Railway.

Mr. H. R. Griffiths, formerly Divisional Superintendent, Great Western Railway, Bristol.

I think I have been a regular reader of THE RAILWAY GAZETTE since July, 1905, and would like to send you my most sincere congratulations on the very valuable work it has done in the Railway sphere :—the extension of its activities affecting other countries, the electric traction sections—and the splendid Supplements, setting out the financial and operating results, are amongst those which have elicited my admiration, and, I am sure, that of many others.

Mr. A. J. Brickwell, C.B.E., formerly Estate and Rating Surveyor, London & North Eastern Railway.

I see the many eulogistic contributions on the centenary of THE RAILWAY GAZETTE, on which I should like to express my congratulations. My association with the paper nearly goes to the Golden Jubilee in the days of McDermott but, at any rate, it has always been a pleasure to me to read the GAZETTE at the week-ends and that pleasure has been added to by the knowledge of the kindness and cordiality which you have always extended to me whenever I have had the pleasure of meeting you.

M. Le Baron Gerard Vuillet, Paris.

I must congratulate THE RAILWAY GAZETTE on having achieved 100 years. I appreciate particularly the fact that information from every part of the world is included in THE RAILWAY GAZETTE, and that the latest developments are described as soon as the information is available, thus allowing readers to be kept in touch with all interesting points without delay.

Mr. R. A. H. Weight, 117, St. Johns Road, Tunbridge Wells.

As a life-long railway enthusiast and a long-standing reader regularly of THE RAILWAY GAZETTE may I be permitted to add my hearty congratulations on the occasion of your Centenary celebration.

Where should we be without your thoroughly informative and accurate articles? The photographs and diagrams are often a sheer joy! Every good wish!

THE RAILWAY GAZETTE is always in demand as soon as it takes its place weekly in the library of the Stephenson Locomotive Society, and there alone you have a very large coterie of appreciative amateur railwayist readers—and some professional ones too.

Your occasional special descriptive numbers are often works of art and masterly compendia of information in themselves. I look forward keenly to others.

Office Central d'Etudes de Matériel de Chemins de Fer, Paris.

Abonnés depuis déjà un certain nombre d'années à la RAILWAY GAZETTE, nous y trouvons sous une forme agréable des renseignements intéressants et nous saisissons l'occasion de son centenaire pour vous adresser nos félicitations.

Nous n'avons pour l'avenir qu'un seul voeu à exprimer; c'est qu'elle continue sa tradition maintenant séculaire et nous l'accueillerons chaque semaine avec le même plaisir et la même satisfaction.

[Having subscribed for a number of years to THE RAILWAY GAZETTE, we find there interesting information in an agreeable form, and we take the opportunity of your centenary to offer our congratulations.

We have only one wish to express for the future, and that is, that it will maintain its tradition, now one hundred years old, and we welcome it each week with the same pleasure and the same satisfaction.]

Companhia dos Caminhos de Ferro Portugueses, Estacao de Santa Apolonia, Lisbon.

The "Companhia dos Caminhos de Ferro Portugueses" congratulates sincerely THE RAILWAY GAZETTE for its 100 years of continuous publication, and being glad to have the opportunity to express her esteem sends her best wishes for a prosperous continuation, hoping it will carry on the useful work of diffusing railway knowledge to the satisfaction and benefit of its readers in all parts of the world.

Mr. H. B. Emley, General Manager, Sudan Railways, Atbara.

I should like to offer you hearty congratulations on behalf of this Administration on the occasion of your Centenary. THE RAILWAY GAZETTE is always read with great interest by the various sections of this railway.

We find information on the following subjects most useful:—

1. Rating problems and measures to secure traffic.
2. Handling and transport of passenger and goods traffic.
3. Legal cases.
4. Traffic operation and organisation.
5. Design of rolling stock on colonial railways.

With every good wish for the future.

Mr. W. Skillicorn, Assistant General Manager (Commercial), South African Railways and Harbours, Johannesburg.

Hearty congratulations on attaining your hundredth birthday! The history of your journal has been coincidental with the history of railway development. I have read THE RAILWAY GAZETTE for many years past and under no circumstances do I miss reading the editorials and the personal railway news section.

Mr. Cecil A. Roberts, General Manager, Buenos Ayres Western Railway, Buenos Aires.

I was most interested to learn that in May THE RAILWAY GAZETTE will have completed one hundred years of continuous publication. Of this period, the Western Railway has been a subscriber for the last 25 years, and we are therefore in a position to be able to appreciate and testify to the high standard of interest and utility that has invariably been maintained in the articles appearing in this periodical. It is very difficult to say which of the features we consider to be the best, as all are so good and instructive.

I wish THE RAILWAY GAZETTE continued success and prosperity for the future.

Mr. Ronald Leslie, General Manager, Central Argentine Railway, Buenos Aires.

I should like to congratulate THE RAILWAY GAZETTE on its completion of 100 years' continuous existence, an attainment which must be extremely rare in the annals of journalism, but which is thoroughly justified by the authoritative tone of the leading articles and the high standard of the technical contributions to your paper.

In my opinion, at the present time in view of the many difficult problems affecting railway administration, the most interesting and useful features of your publication are those bearing on the measures to attract new traffic to the railways, and the curtailment of expenditure.

Major O. Loewenthal, General Manager, Entre Rios Railway, Concordia.

I should like to take this opportunity of congratulating you on the completion of 100 years of continuous publication. Far removed as we are from the Old Country, we yet are able, thanks to your excellent journal, to keep in close touch with railway affairs and progress both at home and in all other parts of the world.

I cannot choose any particular feature of your paper as being more interesting or useful than another, but we are grateful for the generous space you allot to foreign railway news, and especially that from the Argentine.

Mr. J. W. H. Rea, Chief Mechanical Engineer, Buenos Ayres Great Southern & Western Railways.

In view of the centenary of THE RAILWAY GAZETTE, I should like to extend to all concerned in the publication of your journal my hearty congratulations on the progressive and up-to-date policy you have always pursued.

The supplements on Diesel and Electric traction are a most interesting innovation. Of the regular features of the GAZETTE, I consider that the reviews on modern power units and methods of shop production are those which are of greatest interest to the chief mechanical engineer and operating superintendent. Wishing you continued success.

Mr. J. W. Duncan, Acting Engineer-in-Chief, Buenos Ayres Great Southern Railway, Buenos Aires.

It is with appreciation that I read that, in May, THE RAILWAY GAZETTE will have completed 100 years of continuous publication, and I feel that all those who enjoy the interest and instruction diffused by this journal will share the satisfaction of its staff, active and retired, in such a notable achievement.

On my own behalf, and on that of the civil engineering staff of the Buenos Ayres Great Southern Railway Company, I send you and all those concerned hearty congratulations upon the realisation of an event which, in itself, stamps the value of the journal and crowns an endeavour that meets a real need in our profession.

It would be difficult to state which features of the paper are the more interesting or useful, since each serves an end.

The editorials, as a regular feature, are always of the first interest. The special articles vary, naturally, in immediate interest according to the subject treated and the readers' peculiar inclination and office, but must always prove both interesting and useful in their own particular field. The Railway News Section is obviously of interest; the human factor introduced in the Personal Section is welcome, and the Scrap Heap—in lighter vein—often provides amusing entertainment.

I may end this message with the hope and the wish that THE RAILWAY GAZETTE may continue, unabated, its progress, and that it may achieve yet another hundred years of useful publication.

Mr. W. N. Green, General Manager, Salvador Railway, San Salvador.

Please accept our most hearty congratulations on the completion of one hundred years of continuous publication.

The present writer has read your journal with interest during the last thirty years in all parts of Latin America, from Patagonia to San Salvador, and has derived not only pleasure but instruction from it. Personally, as well as on behalf of this company, he wishes you every success for the future hoping that, as you have already been in existence nearly as long as the railways, so you may continue to prosper as long as there is railway news to chronicle.

Sr. L. Perez Castro, Resident Engineer, Compania del Ferrocarril Mexicano.

I take pleasure in congratulating you most cordially in the name of this Company which is the oldest in the country and will in two years more celebrate the century of the first concession granted by the Mexican Government for the construction of a railroad between the capital of the Republic and the port of Vera Cruz.

At the same time I inform you that we read THE RAILWAY GAZETTE with great interest and consider it as one of the journals which in the world renders excellent information as regards railways.

Mr. J. Wilson C. de Souza, Locomotive Superintendent, Mogyana Railway, San Paulo.

We note with pleasure the approximation of the Centenary of THE RAILWAY GAZETTE and its incorporated publications, and would wish to join in what we are sure will amount to world-wide congratulations on such an achievement; an achievement which must have done a great deal to advance railway working in all its many and varied branches in all parts of the world.

The features which we have always appreciated and found of the greatest interest and use are the editorial notes dealing with matters of interest in railway working from all parts of the world, this allowing us to keep up to date in such matters with a minimum amount of trouble.

Wishing THE RAILWAY GAZETTE many more years of successful and useful life.

Mr. J. E. L. Skelton, Leopoldina Railway, Rio de Janeiro.

May I take the opportunity of expressing my satisfaction at the recording of a "century" by THE RAILWAY GAZETTE and amalgamated papers and my best wishes for an indefinite prolongation of your "innings."

Mr. V. J. Smart, Deputy Minister of Railways and Canals, Ottawa.

The centenary of THE RAILWAY GAZETTE will be of more than ordinary interest to your Canadian subscribers in view of the fact that in July of 1936 we, in Canada, will be celebrating the centenary of the establishment of the first steam railway in British North America, a section of line afterwards taken over by the Grand Trunk, and now forming part of the Canadian National system.

No doubt this transportation experiment in the neighbourhood of Montreal was duly noted in *Herapath's Railway Journal*, the forerunner of THE RAILWAY GAZETTE, which, in its hundred years of continuous publication, must have recorded the inception and subsequent development of railway transportation in all parts of the world. This is a happy feature of GAZETTE policy. It keeps its readers in constant touch with the progress of railway development not only in the British Isles, to whose transportation enterprise the world at large owes so much, but maintains a constant survey of the Dominions and the foreign field as well. It is this broad and comprehensive outlook on the part of your publication that I personally find most useful and of absorbing interest.

Sir M. W. Brayshay, M.Sc., Agent, Bombay Baroda & Central India Railway, Bombay.

I congratulate THE RAILWAY GAZETTE on reaching its 100 years of continuous publication. The feature I consider most useful is the record it contains of progress and development in railway methods and equipment.

J. M. Fitzgerald, Vice-Chairman, Committee on Public Relations of the Eastern Railroads, New York City.

As transportation is essential to the well-being of any country, it is important that the public be fully informed as to its transport situation. Your publications have now devoted a century to public education—the presentation of the real facts relating to an industry in which every citizen has a vital stake. You are to be congratulated.

Mr. E. J. Gurski, General Manager, Midland Continental Railroad, Jamestown, North Dakota.

Allow us to congratulate you upon your hundredth anniversary.

The edition of THE RAILWAY GAZETTE devoted to Diesel Railway Traction is, to us, most interesting, and we should like to see you enlarge this part of your journal.

Mr. V. L. Dean, V.D., Superintendent, The Walton Training School, North Western Railway, Lahore Cantt.

I wish to convey congratulations on THE RAILWAY GAZETTE having reached its Centenary. The paper is read with considerable interest in this school by staff of all branches of the railway service. Articles on specialised subjects, improvements and new phases in working based on established principles, and the reports of enquiries by Board of Trade Inspection, are always of much interest.

Mr. J. Fearfield, Manager, Bikaner State Railway, Bikaner.

I congratulate you heartily on the anniversary you will celebrate in May. At the same time I suggest you confine publication to those messages received from more eminent persons than myself. As to those features of your paper which are most interesting, after reading it for over 30 years I can only say that I look forward every week to its arrival and my real difficulty is to find features of little interest. Your remarks in recent issues on the antiquated and unsatisfactory system of distribution of the world's potential wealth from which we all are suffering at the present time have been most thought-provoking.

With renewed congratulations and best wishes for the future.

Mr. P. Ghose, Secretary, Railway Rates Advisory Committee, Government of India (Railway Department), Calcutta.

On the occasion of the celebration of the Centenary of THE RAILWAY GAZETTE, the Railway Rates Advisory Committee, India, wishes it a further long and useful career. Dealing, as it does, with every phase of railway activity, it is studied with interest and profit by its numerous readers.

The Committee has been specially interested in the reports on the decisions of the English Rates Tribunal on matters relating to railway rates and charges, in the valuable contributions on rating policy and practice, and also in the informative and lucid special articles relating to road and rail competition appearing in the journal from time to time.

Mr. G. A. R. Trimming, Chief Mechanical Engineer, East Indian Railway, Calcutta.

It gives me great pleasure in sending my congratulations to THE RAILWAY GAZETTE on the occasion of this publication's Centenary. THE RAILWAY GAZETTE, to my mind, is one of the most readable journals produced, and I consider the articles on locomotive performance and new locomotive design as the most interesting items.

Mr. J. Westwood, Acting Agent, The Bengal & North Western Railway, Gorakhpur.

The fact that the Centenary of THE RAILWAY GAZETTE follows so closely on the centenary of English Railways says a great deal for the enterprise that founded the GAZETTE, as well as for the energy and skill which have kept it so very much alive. But for the living interest that characterises it, and its very general appeal to all those who are in any way associated with Railways, it could not have achieved the success which has followed it for a century. My most hearty congratulations.

XUM

Mr. R. E. Marriott, Divisional Superintendent, East Indian Railway, Allahabad.

As a reader for the past 30 years, I am very pleased to congratulate THE RAILWAY GAZETTE on putting up its "century."

It is easily the most appreciated publication on this Division. Every number seems to contain something of special interest and frequently extracts are made for special application in local cases.

To my mind the special features are the very wide scope of the articles, and the excellence and numbers of the illustrations.

Mr. C. I. Hutton, Locomotive & Carriage Superintendent, H.E.H. the Nizam's State Railway, India.

Technical information is very much appreciated overseas, as it is extremely difficult to obtain information when one is in trouble over details of design or workshop procedure, and unlike home conditions one cannot run round to a neighbouring works to make comparisons.

I suggest that articles on the following subjects would be welcomed by Overseas Mechanical Officers :—

New departures in design of locomotive details with dimensioned drawings. I might say that information of this nature is of far more value than a general description of a new type of locomotive.

Workshop procedure in detail, *i.e.*, it is of more value to have information on the detail procedure with dimensioned drawings of jigs, &c., for, say, the repair of locomotive axle boxes, rather than a general description of a Locomotive Works or part of a Works.

If the above information will give you any assistance in regard to the type of articles which will be of most interest to us, I am sure overseas mechanical officers will very much appreciate your publishing them.

Mr. J. Pearse, Chief Traffic Manager's Office, G.I.P. Railway, Bombay.

I am interested to hear that THE RAILWAY GAZETTE and the journals incorporated with it will shortly complete 100 years of continuous publication and am glad to have this opportunity of offering my congratulations to those who have been responsible for its production. As one who is now engaged in railway service abroad, after having spent some years on a great English railway, I should like to say how much I appreciate THE RAILWAY GAZETTE each week. In addition to keeping railwaymen authoritatively informed of current railway practice throughout the world, it is of peculiar interest as a means of watching the progress and development of English railways in which I retain a lively interest.

As I am engaged in the commercial side of railway operation, I consider that the articles, &c., dealing with such matters are of great interest. While I realise that the demands upon your space must be great, I venture to suggest that, in view of the increasing importance of commercial problems at the present time, a somewhat larger allotment of space to such matters would be widely appreciated. With best wishes for your continued prosperity.

Mr. A. V. Venables, Agent, East Indian Railway, Calcutta.

I was most interested to learn that in May THE RAILWAY GAZETTE will have completed 100 years of continuous publication, and I would say that those who have contributed to this success have earned the gratitude and commendation of railwaymen in all parts of the world.

Speaking for the officials of the East Indian Railway, I can say without hesitation that the GAZETTE has been not only of interest to us, but an assistance the value of which it would be difficult to estimate.

It is not easy to single out any feature for special mention as the subjects dealt with pertain to various branches of the railway and have special interest for each.

Mr. E. L. Manley, Agent, Eastern Bengal Railway, Calcutta.

On behalf of the Eastern Bengal Railway I congratulate THE RAILWAY GAZETTE (with which *The Railway Engineer, Transport, The Railway News*, and *Herapath's Railway Journal* are incorporated) on its successful completion of 100 years of journalistic career. Its informative and instructive articles and comments on railway management, engineering and operation, at home and overseas, are widely and profitably read by railwaymen the world over.

THE RAILWAY GAZETTE has a record of which any journal might be proud and can always be relied upon to give the most up-to-date and accurate information regarding the latest developments and activities in the railway world. I wish the Journal a long career of usefulness and prosperity.

Mr. S. M. Avril, Locomotive and Carriage Superintendent's Office, Government of Baroda State Railways, Baroda.

I congratulate your publication on having completed its first hundred years of continuous publication, and I wish it every success in its second Centenary. It is difficult to say which articles in your paper are the most useful to the railway official, as the various items published by you are all of a very interesting nature.

Mr. W. H. H. Young, Divisional Superintendent, East Indian Railway, Dinapore, India.

I would like to add the congratulations of the officers on this Division of the East Indian Railway to the very large number that you are bound to receive on the Centenary of your valuable paper.

It is not easy to distinguish between the relative value of your regular features, but they all possess a common value of distinct importance. They keep us up to date, and it is felt that when anything new occurs in the railway world we can rely on your paper to tell us about it, with that clarity and brevity so essential to busy people.

My engineers tell me that all articles connected with their work are marked by their essentially practical nature, and that disseminating the experience of others proves particularly useful. The officers of other departments also find that your publication keeps them well informed in all modern developments, and in the attempts being made to combat competition with other transportation agencies.

Lt.-Col. H. L. Woodhouse, M.C., R.E., Director of Civil Engineering, Indian Railway Board.

The Indian Railway Board offer their hearty congratulations to THE RAILWAY GAZETTE on the occasion of its centenary, and hope that it may long maintain the high reputation it has achieved among those interested in the field of transportation.

I am to add that it is considered that the leaderettes on the first three pages of each issue are the most interesting part of the paper.

Mr. J. W. Forrest, Acting Secretary for Railways, New South Wales Government Railways, Sydney.

An intimation of the fact that THE RAILWAY GAZETTE and its incorporated journals have reached a century of continuous publication has been received here with much genuine pleasure, and I would like to convey the felicitations of this Department and the Administration on the occasion.

It is desired to congratulate you on the attractive appearance and the consistently high editorial standard of the GAZETTE. Each issue, as it comes to hand, is closely scanned by the Administration and circulated then among the whole of the executive officers of the Department. In this way the very valuable information which the GAZETTE contains is promptly made available to those responsible for the operation and control of the New South Wales railway system, comprising 6,164 route miles of line and having 40,000 employees.

While each feature of your journal is of very considerable interest to us, I would like to be permitted to say that those articles which contain information on the latest developments abroad, or describe new appliances for handling traffic, and methods for attracting business to the railways where there are competitive transport services, are of the greatest value. Differing as do the conditions under which railways are operated in various countries, there is a fundamental basis of service to the people which is universal, and the interchange of ideas as to how that service should be rendered is of mutual benefit to all railway administrations.

XUM

Mr. T. G. Atkinson, Ballard Estate, Bombay.

In heartily congratulating THE RAILWAY GAZETTE on its completion of 100 years continuous publication, I should like to express my appreciation of the great assistance which this journal renders to engineers both at home and abroad and particularly to those whose activities are centred upon the design, equipment and operation of locomotives and their respective features and the commercial exploitation of railway supplies. It may safely be said that THE RAILWAY GAZETTE and, until lately, *The Railway Engineer*, have been looked upon as one of the chief sources of reference available to the world of British railway operation and management. The amalgamation of these two historic journals has had for their readers the effect of rendering the information, both technical and otherwise, in a more concise and compact form, and a form, moreover, which probably will be welcomed by all.

Particular interest is always displayed in the exceptionally well set up editorials which are not only in themselves news items but frequently are a précis or summary of the more important features embodied in the articles and reports contained in the body of the paper. Of particular use also are the reviews of new designs of locomotives and types of rolling stock and it is probably safe to say that but few engines are designed abroad in the British Dominions without considerable reference to the files of THE RAILWAY GAZETTE and *The Railway Engineer*, for the purpose of obtaining technical data in the drawing up of specifications.

Perhaps it is not out of place to suggest that pages on Overseas Railway Affairs might be enlarged from time to time so that there should be, through the medium of this publication, a more thorough interchange of railway news items.

Herr J. D. Ziesecke, General Agent for Germany, Southern Railway, Cologne.

May I be permitted to express to you my very sincere congratulations on the occasion of the 100th anniversary of THE RAILWAY GAZETTE.

This is certainly a very happy event, and is a full confirmation of the practical value of your publication and of the high esteem in which it is held.

My best wishes accompany THE RAILWAY GAZETTE on entering its second century.

Sr. Don J. Garcia-Lomas, Ingeniero Jefe de la Explotacion, Northern of Spain Railway, Madrid.

Con motivo de la celebración del centenario de esa Revista en mayo, me complazco en dirigir a Vd. mi felicitación por el prestigio técnico y professional alcanzado por THE RAILWAY GAZETTE, que ha sabido colocarse entre los primeros periódicos mundiales de su genero.

[On the occasion of the celebration of the centenary of your Review in May, I have pleasure in sending you my congratulations for the technical and professional prestige attained by THE RAILWAY GAZETTE, which has succeeded in placing itself among the leading periodicals of the world of its kind.]

Mr. Olaf Storsand, Director of Traction and Rolling Stock of the Norwegian State Railways, Oslo.

Amongst the considerable number of technical papers at hand at the Norwegian State Railways, THE RAILWAY GAZETTE is one of the four or five which I always personally peruse.

In the first instance I am looking for articles on diesel traction and steam locomotives, but otherwise I would not like to miss anything that your journal is containing.

Regierungsrat Dr. Fritz Matthes, Reichsbahnoberrat, Königsberg.

The centenary of THE RAILWAY GAZETTE gives me an excellent opportunity to send you my letter of appreciation long intended before. My colleagues and I are very interested in reading THE RAILWAY GAZETTE, over and over again being impressed by the almost overwhelming abundance of news about railroading all over the world. No country, of course, may copy the railway institutions of another country on account of the different conditions. But it gives always fresh ideas and broadens the mind to see the progress of British and the other world railways.

We very often overjoy the "Scrap Heap" too. For: "Ridiculum acri fortius et melius magnas plerumque secat res" (Horatius Sat. 1, 10, 14).

Recording my great indebtedness for THE RAILWAY GAZETTE you regularly send me I beg to present my best wishes for the following hundred years.

Mr. H. A. Gaudy, M.E., 68, Jubilee Street, Berne, Switzerland.

I am very pleased to send you my congratulations on the occasion of the centenary which THE RAILWAY GAZETTE is about to celebrate. Full praise must be given to its editor, who always places a sound key-note to the various and carefully selected articles of each issue, in accordance with the requirements of the readers.

Useless to say, that he keeps track with all the innovations in the means of transport, an item which nowadays is looked at with keen interest. In this regard I find that these features appearing in THE RAILWAY GAZETTE are most useful and most important. With all my best wishes for further success and welfare.

M. S. A. Sperry, Paris.

We note with interest that your valuable journal has completed 100 years of continuous publication. We welcome the incorporation into one representative magazine of several journals dealing with similar subjects, since a great deal of time is saved for the busy reader, who is assured nevertheless of being kept in touch with the latest news and developments.

We especially congratulate you on your foreign news service, which gives valuable information that is often difficult to obtain elsewhere.

Mr. James Steffensen, Hellerup, Denmark.

I am only a reader of short standing (having been transferred, by your courtesy, from the subscription list of *The Railway Engineer* since January).

I should, however, like to congratulate THE RAILWAY GAZETTE on having completed its first century of publication.

My interest in railways is on the technical and operating side, and your technical supplements and articles on signalling practice, station layouts, bridging, and rolling-stock are therefore of greater interest to me than the sections concerning railway shares and railway officers.

I wish THE RAILWAY GAZETTE continued success; I have no doubt that the recent incorporation of *The Railway Engineer* with it will do much to ensure that.

Gebrüder Credé & Co., Niederzwehren bei Kassel.

In celebration of the centenary of THE RAILWAY GAZETTE we send our compliments and at the same time wish to express our best wishes for the future continuation of your publication. We herewith also beg to state how much not only the railway reports and photos interest us, but also the exact instructions of adjudications as printed in your paper.

"Transports," Paris.

Notre revue *Transports* est heureuse d'adresser à cette belle revue qu'est THE RAILWAY GAZETTE ses sincères félicitations et ses meilleurs vœux de longue prospérité pour son centenaire.

Il est inutile de faire l'éloge de sa belle présentation, de la richesse de sa documentation tant technique que photographique et en un mot de l'universalité de sa matière.

Ce qui, croyons-nous est encore plus particulièrement goutté en France c'est cette précision et cette rapidité caractérisant vos actualités qui sont à juste titre considérées comme des modèles du genre.

[Our journal *Transports* is happy to send to that excellent review, THE RAILWAY GAZETTE, its sincere congratulations and best wishes for future prosperity on the occasion of its centenary.

There is no need to enlarge on its good representation or the diversity of its information, both technical and photographic, in fact, the universal appeal of its contents.

In our opinion, France most appreciates the speed and precision which characterises its news, which rightly make it a model of its class.]

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" Revue Générale des Chemins de fer," Paris.

Nous sommes heureux, à l'occasion du centenaire de votre revue, de vous dire tout le bien que nous en pensons et que nous avons déjà exprimé, lors de la correspondance à laquelle a donné lieu l'institution d'un échange régulier entre votre magazine et le nôtre.

Nous ne pouvons d'ailleurs donner de meilleures preuves de l'intérêt que presente, à notre avis, pour le monde ferroviaire tout entier votre remarquable organe, qu'en le citant très fréquemment, comme nous le faisons, dans nos propres colonnes.

Veuillez donc trouver ici, au moment de ce centenaire, les souhaits que nous formons pour la prospérité de la RAILWAY GAZETTE.

[We are glad, on the occasion of the centenary of your journal, to say how highly we esteem it—an appreciation that we have already expressed during the correspondence which brought about the regular exchange of your review and ours.

We feel that greater proof of the interest which we consider your remarkable organ has for the railway world cannot be given than by quoting it in our own columns, which we do very frequently.

On the occasion of this centenary, please accept our best wishes for the prosperity of THE RAILWAY GAZETTE.]

Stewarts and Lloyds Limited, Westminster.

We heartily congratulate THE RAILWAY GAZETTE on reaching its centenary. Success in technical journalism can be earned only by the consistent provision of full information in an interesting manner and yet with complete accuracy. That the reputation of your journal has grown steadily through all these years is a record of which you may well be proud, and which enables us with every confidence to wish you many years of prosperity to come.

Mr. R. E. Morley, Traffic Manager, Bryant & May Limited, London.

Heartiest congratulations on your Centenary. There is no publication on transport matters read with greater avidity in this office than your most excellent journal.

Mr. W. R. Buxton, The Eyre Smelting Co. Ltd., London.

It gives us considerable pleasure to take this opportunity of congratulating you on the celebration of your Centenary.

It is many years now since we first started advertising in THE RAILWAY GAZETTE and our advertisements have continued without a break. This we think is sufficient evidence of the high opinion which we hold of the standing and importance of your publication in the railway world. If any further evidence were needed it would be found in the further series of advertisements which we are now running in your Diesel Supplement. We offer you our best wishes for your continued success and prosperity.

Mr. S. H. H. Barratt, Director, Messrs. J. W. Roberts Limited, London.

We have much pleasure in offering you our congratulations on the Centenary of THE RAILWAY GAZETTE and incorporated journals. The technical and other information contained in THE RAILWAY GAZETTE is, we feel sure, highly appreciated by all those throughout the world interested in road and rail transport, particularly the descriptions of new designs and innovations.

The information given under the heading " Contracts and Tenders " is also very useful to contractors, and your editorial remarks keep one thoroughly in touch with railway progress in every direction in practically every department of railway operation, and in our opinion are at times indirectly responsible for some of the improvements that have been made from time to time.

Mr. H. W. Foy, Metropolitan Vickers Electrical Export Co. Ltd., Rio de Janeiro.

Regarding the features of the publication which I think most interesting, I would say that, in my opinion, I find that the articles describing the fight now going on between steam, electrical and diesel-electric locomotives most enthralling; adding that in the fight, at least in the Brazilian arena, where hydro-electricity is cheap and plentiful, the electric locomotive will come off winner.

Trusting your extremely useful magazine will continue to merit the success it deserves.

Mr. Hector Hill Bertacin, Fabrica Nacional de Cabinas de Signaes " Systema Bertacin, " São Paulo, Brazil.

I have been a regular reader of your paper for nearly 20 years; getting it punctually always and finding it exceedingly well edited. This, in conjunction with your own brilliant and intelligent contributions, compels the admiration of us foreigners resident in Brazil.

I have further to observe that your paper is always in the forefront, accompanying most assiduously the progress of engineering throughout the World, and not sparing pains whatever in making us acquainted with the most minute details of that progress.

I hereby express my best wishes for your periodical to continue enjoying centuries of prosperous and efficient circulation. Lastly, I should like to say that as a railway engineer of long standing, I have greatly profited from your excellent paper.

Mr. A. MacNay, A. & H. MacNay, Consulting Engineers, Durban.

We would like to congratulate you on your centenary, and wish you many more years of successful publication of your most interesting GAZETTE. We are most interested in the locomotive side, but the general information regarding the progress made in all parts of the world is also greatly appreciated.

Saxby & Farmer (India) Limited, Calcutta.

We offer you our heartiest congratulations on the forthcoming centenary of THE RAILWAY GAZETTE, which we have always found interesting and helpful reading in the matter of subjects which are of general interest to engineers as well as those which make a special appeal to us from a business point of view.

We hope that THE RAILWAY GAZETTE will long continue to hold the interest and goodwill of its many readers.

Mr. E. D. Mitchell, Managing Director, Alfred Herbert (India) Limited, Calcutta.

We are very glad to hear that you will have completed 100 years' continuous publication in May, and we wish to congratulate you on such a splendid achievement.

We always peruse THE RAILWAY GAZETTE with great interest, and think that you have some excellent reviews on machine tools. The railway equipment section is also of interest to us, as it always deals with railway matters on a world-wide basis.

Mr. J. G. Bean, Manager (Bombay), C. C. Wakefield & Co. Ltd.

We take this opportunity of sending you our heartiest congratulations on the completion of 100 years of continuous publication and we wish you all prosperity in the future.

We have always found your journal to contain many matters of particular interest, and although it is very difficult to decide which features are most useful, we think that those detailing the special performances and particulars of new machines are especially helpful. Again wishing you all success.

Mr. F. A. Preston, President, The P. & M. Company, Chicago.

It is a great pleasure for us to extend to you our congratulations on one hundred years of continuous publication of THE RAILWAY GAZETTE. We have read your publication over a period of years, and have always appreciated its reading matter, which is of great interest, as well as its most attractively arranged advertisements.

It is evident that THE RAILWAY GAZETTE has met with the gracious approval of its readers, for which its editors are entitled to much credit, and may we not extend to you our best wishes for your continued success.

Mr. B. D. Sullock, National Bank of India Limited, Zanzibar.

I beg to congratulate THE RAILWAY GAZETTE and the journals incorporated with it on having completed 100 years of continuous publication. I have read THE RAILWAY GAZETTE for many years and have always found the articles in it to be of great interest to anyone interested in railways, not only from a technical point of view, but also from the non-technical. The features of the paper which I have always found to be of the greatest interest are (1) the articles describing a change over of signalling from mechanical to electric, such as the ones last year which described the change-over at Cardiff or the previous year's description of the change-over at King's Cross, and (2) the articles which describe the causes leading up to an accident. Wishing you every success in the future.

Mr. E. R. Mellenger, Technical Representative, Harland & Wolff Limited, Montreal.

It gives me great pleasure to extend my felicitations to you at this time of your centenary and I sincerely hope that the future will be even brighter for you.

In regard to my interest in THE RAILWAY GAZETTE, as you know, I have been a reader for the past 10 years and the features in which I am most interested are those referring to diesel railway traction, especially diesel engines and hydraulic transmissions, and I can frankly tell you that there is no other journal dealing so well with those subjects as yours.

Mr. O. A. Rosboro, Vapor Car Heating Co., Inc., Chicago.

We note that THE RAILWAY GAZETTE, with its allied publications, is celebrating a centennial of continual publication.

We have been very much interested in the very complete way in which you have described development in transportation, both as regards locomotives and cars, and also have noted with much interest your editorial comments and the several published articles relating to the importance of comfortable temperatures in passenger cars.

May we wish for your publication another century of even increased influence and circulation.

Mr. A. F. Roozeveld, V.D., Ven, Geldermalsen, Holland.

I congratulate you and also the other members of the editorship highly with this festivity. To me it is a great enjoyment, to open every Saturday in the evening the well-known roll containing THE RAILWAY GAZETTE, which offers always interesting essays and notices, frequently illustrated with designs and beautiful photos from all parts of the world.

Commonwealth Sales Corporation, Eddystone, Pa., U.S.A.

We wish to congratulate you on the 100 years of continuous publication and upon the high standard you are now maintaining. We find your magazine interesting, and it keeps us posted on current European rolling stock designs and practices.

Mr. Burt T. Anderson, 347, Madison Avenue, New York, U.S.A.

The 100th anniversary of THE RAILWAY GAZETTE in May, 1935, marks a record which you and your readers may well be glad to celebrate. We have found THE RAILWAY GAZETTE of particular interest and value for its editorials, the excellent photographs and maps which are so freely used to illustrate the various articles, and the operating features on the railroads over the entire world. Naturally those articles pertaining to signalling always receive our careful attention, especially those pertaining to installations in the U.S.A., as the overseas viewpoint is interesting and worthy of our careful study.

Mr. E. E. R. Tratman, C.E., Wheaton, Illinois, U.S.A.

As an interested reader of THE RAILWAY GAZETTE for some years, I note with particular interest that the paper is about completing its first 100 years of continuous publication, for which occasion I offer my hearty congratulations, combined with good wishes for a continuously successful future.

To me as a civil engineer and somewhat of a specialist in track and track work, the recent absorption of *The Railway Engineer* by THE RAILWAY GAZETTE is specially attractive, and I look with pleasure for more information as to present day engineering and maintenance-of-way aspects of railway affairs, to supplement those of motive-power, rolling-stock, signalling, operation or working, and administration. However, in all these departments I find material of use and interest. The expressions of opinion and experience in the "Letters to the Editor" columns are usefully supplemental to the general descriptive matter.

It seems to me that certainly an outstanding feature of THE RAILWAY GAZETTE is its department of "Overseas Railway Affairs," together with abundant notes and articles on railways and railway affairs in many foreign countries, giving an up-to-date view of railway developments in all parts of the world. Such information is doubtless of special interest and value to the large number of your readers, railway men, engineers, manufacturers and others, who find in the colonies and foreign countries a professional and commercial field for exploitation and development.

To my congratulations to THE RAILWAY GAZETTE and its staff on what they have done and are now doing, I add my wishes for their ever-increasing success and prosperity.

Morison Pollexfen & Blair Limited, New York.

Please accept our heartiest congratulations upon the completion of one hundred years of publication of THE RAILWAY GAZETTE. In the course of our business it is essential that we keep abreast of railroad activities and changes and especially such as pertain to English roads.

THE RAILWAY GAZETTE covers this matter so completely that we number it among the most valuable and useful journals that we subscribe to and look forward to the receipt of each issue. With best wishes for your continued success.

Mr. L. K. Sillcox, The New York Air Brake Company, 420, Lexington Avenue, New York.

Each week I look forward to reading your editorials as I find these to be not only thought-provoking, but good guides to reliable modern railway procedure. Your paper is a distinct and constant contribution toward improved railway operation and management.

Mr. Eric Crickmay, 300, West 21st Street, New York City.

May I take this opportunity of congratulating you on the continued excellence and up-to-dateness of THE RAILWAY GAZETTE. Considering that the Newcastle run was only made on March 5, it was a fine feat to print it in full detail in your issue of March 8.

From Under Dog, not Chairman of any Railway Company

DEAR EDITOR,
I've read with joy,
The notes of all the Great.
Congratulating you upon
One hundred years—no break.
You say that you appreciate
The last note as the first,
So why not let an Under Dog
Just write the last and worst?
I've read you, Sir, last Saturday
For forty years and more.
I cut you up and index you
And keep you in cold store.
You are my vade mecum, Sir,
I steal your very credit,
For when I'm asked when blank did blank
Unto my files I creep to swank,
For there it is, from out your pages
To improve the mind of sages.
And when not cut your paper goes
Out to Malay for pals "to nose."
What Under Dogs like me would do
Without your weekly journal,
I liken to a coconut
From which is stole the kernel.
So, on this your centenary,
An Under Dog makes bold
To wish you every wish you wish,
A future bright as gold.
And if you keep the standard high,
As past achievements tell,
You need not fear to feel
You've done your readers well.

ANON.

IMPRESSIONS OF OVERSEAS TRANSPORT

XVIII—By a general speeding-up of services and the use of special colour schemes to familiarise the public with the principal expresses, the New South Wales Government Railways are securing better passenger patronage

By A. W. ARTHURTON, formerly Secretary, British Railways Press Bureau

LANDING in Sydney on New Year's Day, I found it was one of the public holidays which our Australian cousins know so well how to enjoy. It was mid-summer, with a blazing sun, and the excellent transport facilities to the numerous bathing beaches within easy reach of the city were being taxed to the utmost. Railway, tramway and road facilities in Sydney, however, are so extensive and of such interest that they deserve a chapter to themselves.

Railway building in New South Wales, as in the other States, was the prelude to settlement on the land, as with few navigable rivers an extensive system of railway transport was indispensable to the development of a country with unlimited natural resources, but with producing centres a considerable distance from the seaports and thus from potential markets. Many of the lines have thus been built for developmental purposes, and the Government makes substantial contributions towards the loss involved in working them. Construction, however, has been rendered difficult by the Great Dividing Range, which runs near the coastline and had to be crossed by the trunk lines going north, west and south at heights varying from 2,000 to 4,500 ft. above sea level. Crossing the Blue Mountains, for example, the line rises more than 3,000 ft. in a distance of 30 miles. The severe gradients on these sections not only increased the cost of construction but have somewhat limited the loads and speeds which are possible in other parts of the State.

Although, as recorded in the article in this series on "The Gauge Problem in Australia," there is a coast route of standard gauge throughout from Sydney to Brisbane, by the inland route a change of trains is necessitated at Wallangarra to the 3 ft. 6 in. gauge. This route crosses the Darling Downs and the Green Mountains, but 29 hr. is occupied on the journey between Sydney and Brisbane, as against 21 hr. by the direct coast route. For 600 miles north of Sydney and 100 miles to the south there is a stretch of coastal railway serving some of the most productive country in the Commonwealth. Within this area are two of the three principal coalfields possessed by New South Wales, that at Newcastle being one of the largest in the world.

Express Trains

The line to Melbourne, which runs south-west from Sydney, is one of the busiest in the State. The night express from Sydney is the most favoured by passengers and leaves at 7.35 p.m. The sleeping cars are of the 2-berth compartment type first class and 4-berth second class. They are roomy and comfortable, and are fitted with special ventilation, washbasins, lockers and plenty of shelf accommodation, as well as reading lamps and electric fans. At Albury, on the Victorian border (400 miles), which is reached at 7 o'clock the following morning, change has to be made to the 5 ft. 3 in. gauge, and the train arrives at Melbourne at 12 noon. In the reverse direction the night express leaves Melbourne at 5.30 p.m., reaching Sydney at 10.15 a.m. next day.

Acceleration of services has been accompanied in the case of long distance trains by considerable expenditure on the track and other details, but speeding-up of the shorter country journeys was made possible by the use of lighter rolling stock. This was obtained by the conversion of many of the short side-door compartment carriages. These now have a centre entrance, with either a centre or staggered aisle leading to cabin compartments. This converted stock is also used on the specially coloured trains known as The Caves Express (blue) and the South Coast Daylight Express (green).*

The famous Jenolan caves, from which the Caves Express takes its name, are situated in a deep, rugged valley 36 miles from Mt. Victoria station, where the train terminates, and motor cars are provided for the benefit of visitors to the Jenolan Caves House, an excellent hostel under the control of the Government Tourist Bureau at Sydney. The drive is one of great beauty, particularly during the descent from 4,200 ft. to the Jenolan Valley and the final passing through the semi-darkness of the Grand Arch and emerging into daylight in the Caves House gardens.

The Intercity Express and the Newcastle Commercial Limited (both coloured maroon) were at first made up of converted stock, but the coaches now used are two sets of four re-conditioned Pullmans, running on six-wheel bogies and coloured similarly to the previous sets.

Popularising the Railways

In addition to the painted engines on the services referred to, coloured engines are used to work many well-known trains. The painted engines, in addition to the special care bestowed upon them by the enginemen, have stimulated public interest, and the trains they haul are much better known than was formerly the case. That the fast timings now in operation are appreciated is demonstrated by the increased patronage given. Close attention is also paid to the comfort of the passenger, and 25 all-steel corridor cars (fitted with roller-bearing axleboxes) are under construction and have been designed to provide the maximum comfort for long distance passengers. A further development is the provision of four diesel trains to give a fast and frequent service between country centres. Air conditioning will be a feature of these trains, the first of which will be in service before the end of the present year.

AFRICAN RAILCARS.—Some petrol railcars with a top speed of 50 m.p.h. have been sent from Italy to Eritrea to maintain a passenger service between the port of Massawa and the inland town of Asmara, which is about 8,000 ft. above sea level. They are of the standard Littorina type as built by Fiat, and described in THE RAILWAY GAZETTE for August 4, 1933. It will be recalled that these cars have aluminium sideplates upon electrically-welded steel frame members, self-contained engine bogies upon which are mounted 6-cylinder 130-b.h.p. engines, and roller bearing axleboxes.

* See THE RAILWAY GAZETTE of February 23, 1934, pp. 294 and 300; also the Overseas Number of November 28, 1934, page 2.

ARGENTINE GOVERNMENT COMMITTEE

In its report the committee of investigation has gone straight to the root of the Argentine railways' troubles and has made a series of recommendations that should be far-reaching if adopted

IN our issue of April 26 we referred in an editorial note (page 765) to the fact that we were then expecting details of the report of the Argentine Government Railway Investigation Committee from our correspondent in Argentina. These have now been received, and from them it appears that the report opens by laying stress on the difficulties of the Argentine railways and by pointing out that the heavy decline in their net profits—which dropped from $165,000,000 pesos in 1929 to $75,000,000 pesos in 1933—is the most visible manifestation of the seriousness of the railway crisis. Comparing the net profits with the capital, they represent a net interest, including differences on exchange, of 1·82 or 1·97 per cent., according to whether one takes the capitalisation in accordance with the accountancy of the companies or that accepted by the Dirección-General de Ferrocarriles. In either case, such a meagre rate of interest is hopelessly inadequate for the maintenance and efficient development of the services. Moreover, on February 28 last, the shares of the following companies, with a nominal value of £100, were quoted as follow:—Southern, 25½ per cent.; Central Argentine, 16½; B.A. Western, 22, and B.A. & Pacific, 8. Such extremely low quotations, coupled with the fact that for several years past the ordinary shareholders, representing a capital of over $1,200,000,000 paper, have received no dividends, is liable to react adversely on the credit of the Republic generally. The fundamental cause of the serious decline in the net profits was the smaller traffic and consequent diminution in the gross receipts which, between 1929 and 1933, dropped from 591 million pesos to 405 millions, a reduction of 31 per cent. Unfortunately, however, circumstances over which the companies had no control, prevented them from reducing expenditure in an equal proportion. The decline in traffic is most noticeable in the higher rated goods and in passenger traffic. This decline in traffic movement is largely due to the general economic depression, but road competition has also been a contributory factor. The report continues by stating that, during 1934 and the months that have elapsed in the current year, a slight increase in the receipts has been registered, but, at the same time, expenses are again on the up grade owing to the restoration last year of the salary and wage-cuts, and to the necessity for increased expenditure on the renewal of rolling stock and equipment, which in recent years has been restricted to a minimum, pending an improvement in the financial situation. Last year the total sum allocated to renewals was $6,500,000 paper, as compared with an annual expenditure under this head of $24,000,000 when the railway crisis started.

Effect of Exchange Rates on the Companies

The committee is of opinion that no appreciable improvement in the financial situation of the companies can be expected unless certain unfavourable factors, which have always been latent, but whose adverse effects are only apparent in times of crisis like the present, are removed. As the volume and value of the traffic are dependent upon circumstances beyond the control of the companies, remedies must be sought in the reduction of working expenses in every form and sector in which they are incurred. In this connection, the report points out, it is significant that in all countries where railway receipts have fallen as a result of the economic crisis, the railways have been assisted to reduce expenditure and to recuperate or recover traffic liable to be lost by the unequal competition of road transport. A further important point made in the report is the fact that the Argentine railways, although built by private capital, perform a public service by delegation and under the supervision of the State, and it is to the national interest to maintain their efficiency and financial stability. Furthermore, it must be remembered that by reason of the four following unquestionable facts, that (*a*) the capital of the companies is recognised in gold; (*b*) the expenditure they have incurred was fixed in the same currency; (*c*) their actual financing on the basis of loans and debentures has been effected abroad; and (*d*) the bulk of the materials used is of European origin (owing to their not being produced in the country), the companies have to convert into gold the figures shown in the balance sheets in national paper currency in order to be able to transfer to foreign countries the remittances required to meet the interest on their loans, to pay for materials and, when possible, to distribute dividends on the invested capital, which came to the country under the protection of express legal and constitutional guarantees. So the result has been that, for instance, during the financial year 1933-34, the company-owned and worked railways when remitting funds abroad had to pay the differences in exchange between parity and the quotation of sterling, to a value of 32 million pesos. By June 30, 1934, owing to the restrictions in force, another 30 million pesos had accumulated, awaiting exchange permits, and had the companies been able to remit this additional sum, the loss under this head would, the report estimates, have reached the staggering total of $54,000,000 paper. In fact, the estimated loss on exchange is anything up to 40 per cent. of the net profits, thus constituting one of the most serious adverse factors which the companies have to face.

Recommendations of the Committee

The committee lays special stress on the necessity for cheapening the cost of transport by repealing a number of regulations which at present hamper the railways, increasing their expenditure and preventing them from obtaining the maximum yield. The working of lines which did not pay, owing to their small traffic, should not be allowed to be a burden upon the rest of the system. The running of trains carrying only a small number of passengers, or the maintenance of stations—to the number of about 400—with an average daily movement of 27 passengers and 8 tons of goods are, in the opinion of the committee, sheer waste. In order to secure economies of any importance in working, closer collaboration between the railways ought to be facilitated and encouraged, so as to combine their efforts and unify their interests. This would tend to reduce expenses and facilitate the implantation of modern systems of administration and the integral readjustment of the services. Under the head of exchange, the committee considers that the Government should endeavour to relieve the companies' difficulties in this

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connection either by the adoption of special measures designed to that end, or by fixing a special rate for the railways, intermediate between that granted to importers and the rate at which the Government makes remittances abroad for the payment of its foreign debts. The report also recommends the division of the railways in accordance with their transport capacity, and in this connection refers to the Government decree dated December 30, 1933, relating to the classification of the lines into two categories. It mentions that there are stations and large sections of lines handling very little traffic, the working of which involves a loss, and where these conditions exist, recommends the employment of railcars, omnibuses or lorries. It also considers that, to recover traffic lost owing to lorry competition, the fixing of differential tariffs is indispensable.

Co-ordination of Transport Urged

The companies should, moreover, be authorised to combine rail traction with the collection and delivery of goods by lorry, with a view to organising a door-to-door service. In addition, the committee expresses the opinion that there are many obsolete regulations which should be amended or abolished. Among the obligations imposed upon the railways which, it points out, are specially onerous are those relating to level crossings, and adds that the present tendency is to reduce the number of those provided with gates or barriers. The elimination of special tariffs that involve a reduction in prices not justified by the nature of the goods carried is recommended, as is also a readjustment of the competitive tariffs between companies and the adoption of a single tariff classification for all the railways, at any rate for combined transport. River transport should be the subject of special regulations so as to ensure an efficient co-ordination between rail and water services to the advantage of both. The opinion is also expressed that the transfer of concessions or railways, by means of consolidations or fusions, should be permitted only with the authorisation of Congress. Finally, the committee deems it a matter of the greatest urgency that the working regulations and scale of wages (" escalafon ") should be modified to enable the staff to be utilised to better advantage, and thus obtain a higher output during the maximum working hours. This comprehensive report is signed by Dr. R. M. Ortiz (a former Minister of Public Works), Señor Pablo Nogues (General Manager of the State Railways), Dr. Ramon Videla (Local Director, B.A. & Pacific Railway), Dr. Adolfo Bioy (representing the Argentine Rural Society), and Señor Luís Colombo (Chairman of the Argentine Industrial Union), and should carry much weight with the Government, especially as it expresses the carefully considered opinions of so authoritative and representative a committee, appointed by the President of the Republic.

THE FIRST RAILWAY IN AUSTRIA

In view of the summer congress of the Institute of Transport in Austria during the next fortnight, and especially the visit to Linz, the following account is appropriate.

ONE of the earliest overland trade routes on the European Continent was that linking the rivers Danube and Moldau (now called Vltava by Czechoslovakia) and the efforts to improve the means of communication on this route eventually resulted in the construction of Austria's first railway, and the first public railway on the Continent. Mediæval plans for joining the two rivers by canal were shelved for a variety of reasons, but as trade grew the subject came more and more before the attention of the public. The Royal House of Austria, early in the XIX century, caused plans and proposals to be elaborated by a number of home and foreign experts, and appointed Dr. Franz Joseph Ritter von Gerstner, Professor of Mathematics, Mechanics, Art and Philosophy at Prague University, to examine them.

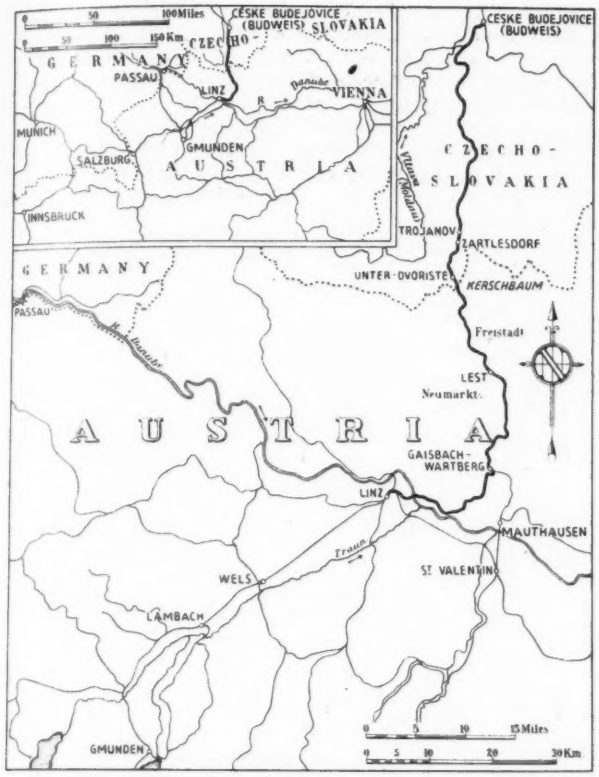
The Professor reported that the best scheme was that put forward by a Professor Walcher, noted for his lectures on mechanics. It was the shortest route of all (38 km.) and the cheapest (5 million florins, CM.*). It comprised a canal from Linz, through the Haselgraben, over the Höhenzug in Miesenwalde to the Moldau, near Joachimsmühle, and also required that the river should be rendered navigable from there to Budweis (76 km.). In order to get over the Höhenzug (with its highest point 495 m. above Linz and 199 m. above Joachimsmühle), a complicated and cumbersome series of no fewer than 275 locks was necessary, which would have caused so much hindrance and increased the cost so greatly that—according to Gerstner—the canal route would have been three times as expensive as the road and would have brought only disadvantages.

On March 31, 1808, a memorable day in Austrian railway history, Gerstner reported the results of his investigations to the Hydrotechnic Association in Prague and proposed a railway line—a transport medium of which he had heard from England, but then unknown on the Continent. Developed from the needs of the old colliery tracks, the railway offered the advantage that a horse could draw 7 to 10 times as much on a smooth rail as on a road.

Gerstner advocated a horse railway from Linz to Joachimsmühle and opening up of the Moldau to shipping as far as Budweis. Later, he proposed to carry the line to the last-named town, at a cost of 2 million florins CM., but as this amount was very difficult to raise, he suggested State support. Having a great deal of other work to attend to, he left the project in the hands of his son, Franz Anton Ritter von Gerstner. At the beginning of 1823 the latter applied for a concession, and on September 7, 1824, the Emperor Franz I granted him the exclusive right of building a *holz und eisenbahn* (wood and iron road) between Mauthausen and Budweis. With the support of two Vienna banking houses, a company was formed under the title of " k.k. privilegierte I, österr. Eisenbahngesellschaft," and the first sod was stated to have been turned on July 28, 1825.

The first section, that from Budweis (now called České Budějovice) to Trojanov, was opened on September 7, 1827. The centenary was duly celebrated (see THE RAILWAY GAZETTE for October 7, 1927) when a large gathering of railway representatives from various parts of the Continent met at Unter-Dvoriste, the frontier station between Czechoslovakia and Austria. Very little of the original road is still in existence excepting the remains of some of the bridges, and these were visited by the centenary party. The line was extended to Kerschbaum on September 30, 1828, and shortly afterwards Gerstner junior retired in consequence of differences of opinion as to the methods of building and operating the railway. From the outset both horse and bullock traction were employed, but Gerstner wished to introduce locomotives. When he had been asked by a Royal commission to carry out his father's ideas, he came to England

* 1 fl. CM. (Gulden Komentionsmunze) was the equivalent of 1·80 M. or 3 Austrian schilling.



Sketch map showing present position of the railways around Budweis, Linz, and Gmunden

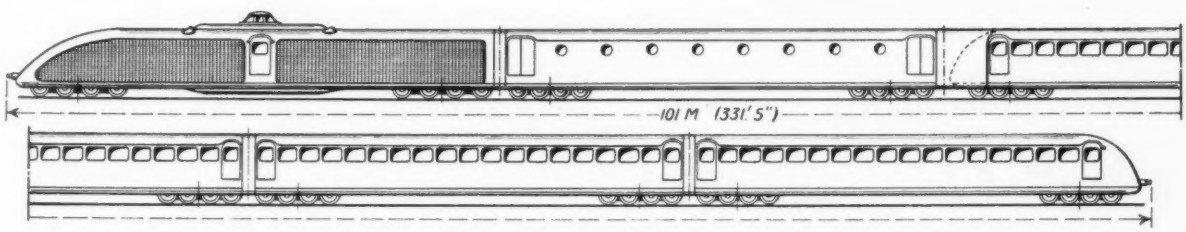
at the age of 27 (in 1820) to examine railways here and probably saw colliery line locomotives at work in the Tyneside area.

From the beginning of 1829 he was replaced by Mathias Schönerer, who completed the railway a further section from Kerschbaum to Lest on its original alignment, but recommended not proceeding with the line thence to Mauthausen (which had not been begun), but diverting the route from Lest to Linz. This course was adopted and the line was opened through to Linz on August 1, 1832, and thus completed the railway between the Moldau and the Danube.

The line was built to a gauge of 1·106 m. (3 ft. 7½ in.) and had a ruling gradient of 1 in 120; the sharpest curve had a radius of 189·6 m. On the main line animal traction was retained until 1872, but an extension from Linz to Gmunden, which had been planned in 1830, was converted to locomotive traction in September, 1854. This was the first narrow gauge steam-operated railway in any of the Germanic States and was preceded in Europe only by the Antwerp-Ghent line, built to the unusual gauge of 1·151 m. (3 ft. 9¼ in.) and opened ten years earlier.

In 1857 the undertaking passed to the Kaiserin Elizabeth Railway Company (the operator of the Vienna-Salzburg line) and in 1869 that company rebuilt the railway to standard gauge and for locomotive working. The upper Austrian part was then altered and the line diverted to go from the mountains to Gaisbach-Wartberg, and thence one fork to St. Valentin and one to Linz. The last horse-drawn train ran on December 12, 1872, between Linz and Kerschbaum. The narrow-gauge Linz-Lambach section of the Gmunden line was abandoned when the standard gauge main line from Vienna through Linz, Wels, and Lambach to Salzburg was completed, but the Lambach-Gmunden section remained narrow gauge until conversion in 1903.

BUGATTI SUPER-PRESSURE LOCOMOTIVE FOR THE P.L.M.



To run comparative trials with the two 4,000 b.h.p. diesel-electric locomotives described in our *Diesel Railway Traction Supplement* for March 22, the P.L.M. Railway has ordered a streamlined steam locomotive of most unusual design from the Bugatti works. Although intended primarily for the haulage of fast light trains over the whole 695 miles from Paris to Menton, this machine will be capable also of working normal heavy expresses and fast trains making frequent stops.

The main features are a super-pressure water-tube boiler of the Velox type, and uncoupled driving axles propelled by individual high-speed geared steam engines. The boiler is being built by Brown Boveri, and will be fired by oil in order that long non-stop runs may be made without the necessity of cleaning the firebox and smokebox, and without taxing the capacity of the fireman. The evaporative capacity is to be nine tons of steam an hour at a pressure of about 800 lb. per sq. in. The decision to employ individually-driven axles was made on account of the magnitude of the disturbing forces set up by the reciprocating parts of a normal locomotive and because of the long rigid wheelbase which would have been necessary to accommodate an ordinary layout to develop 4,000 h.p. continuously.

A double-bogie tender for this locomotive and a three-car light-weight train are also being built by the Bugatti firm, and the engine and train will be streamlined as one unit. At the moment a service speed in excess of 140 km.p.h. (87 m.p.h.) is not visualised, but apparently it is the intention to maintain something like this speed up appreciable grades. The service contemplated is equal to a mileage of 80,000 km. (50,000 miles) in three months, which it is hoped to maintain without difficulty by reason of the special design of the engine and boiler. Delivery of the complete train is not expected before the second half of 1936.

AIR MINISTRY SURVEY OF INTERNAL AIR LINES.—The Air Ministry has undertaken to make a survey of Great Britain to determine the probable development of home air lines.

XUM

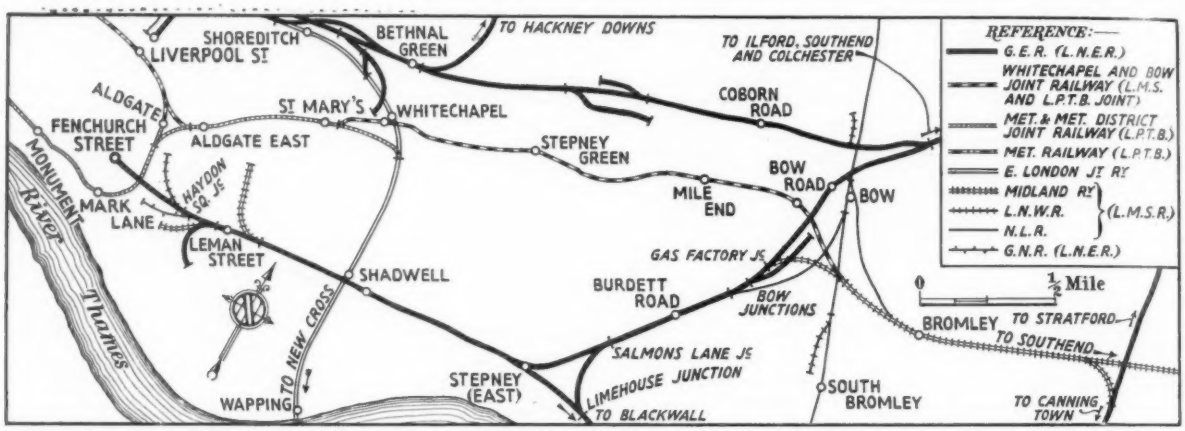
RESIGNALLING FENCHURCH STREET STATION, L.N.E.R.

Complementary to the description of the engineering works at and near Fenchurch Street station described last week, this article deals with the colour-light signalling now installed between that station and Gas Factory Junction, Bow

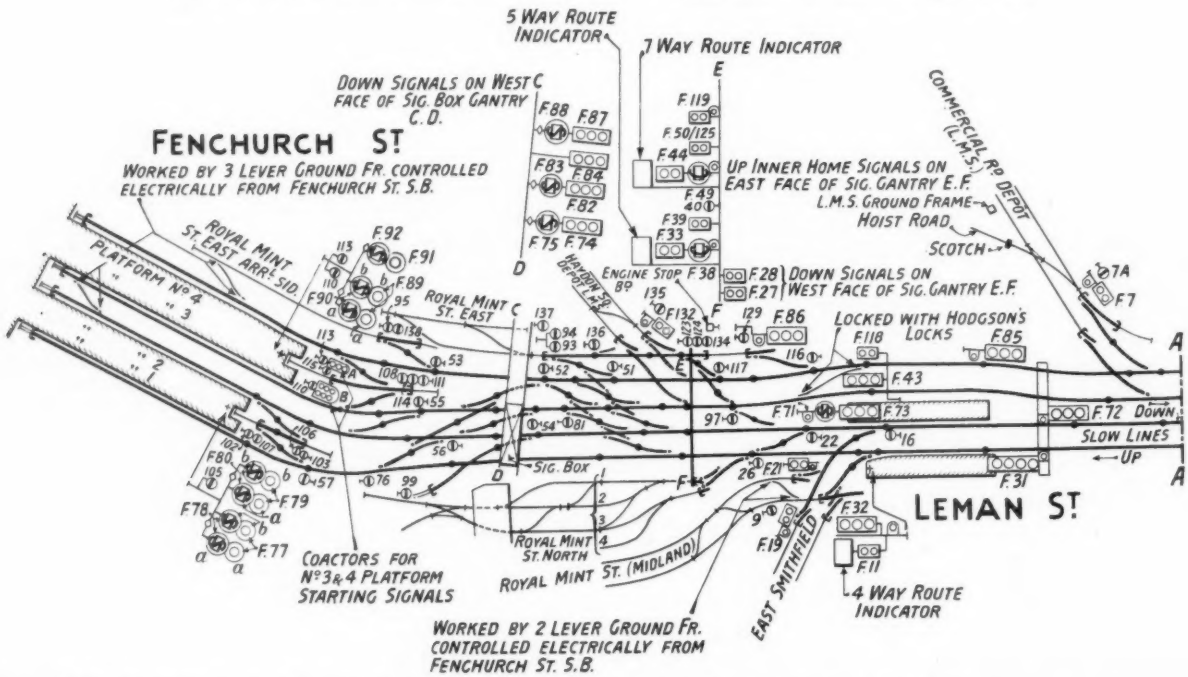
CONCURRENTLY with the engineering work in Fenchurch Street yard and the approaches thereto, which were described in last week's issue, the whole of that area, up to and including Gas Factory Junction, has been resignalled, as shown on the accompanying diagram. Track circuits on both lines to Bow Road and on the line from Campbell Road Junction have been included. The whole area covers about 12 track miles. The new signalling was brought into use on Sunday, April 14.

Prior to these changes being made there were, between Fenchurch Street and Stepney, signal boxes at Haydon Square, Leman Street, Christian Street and Shadwell, and, between Stepney and Bow Junctions, boxes were situated at Salmons Lane Junction, Burdett Road, Bow Road and Limehouse Junction. A new box has been provided at Fenchurch Street and considerable changes made at Stepney, but these are now the only signal boxes in the area and, consequently, eight have been saved.

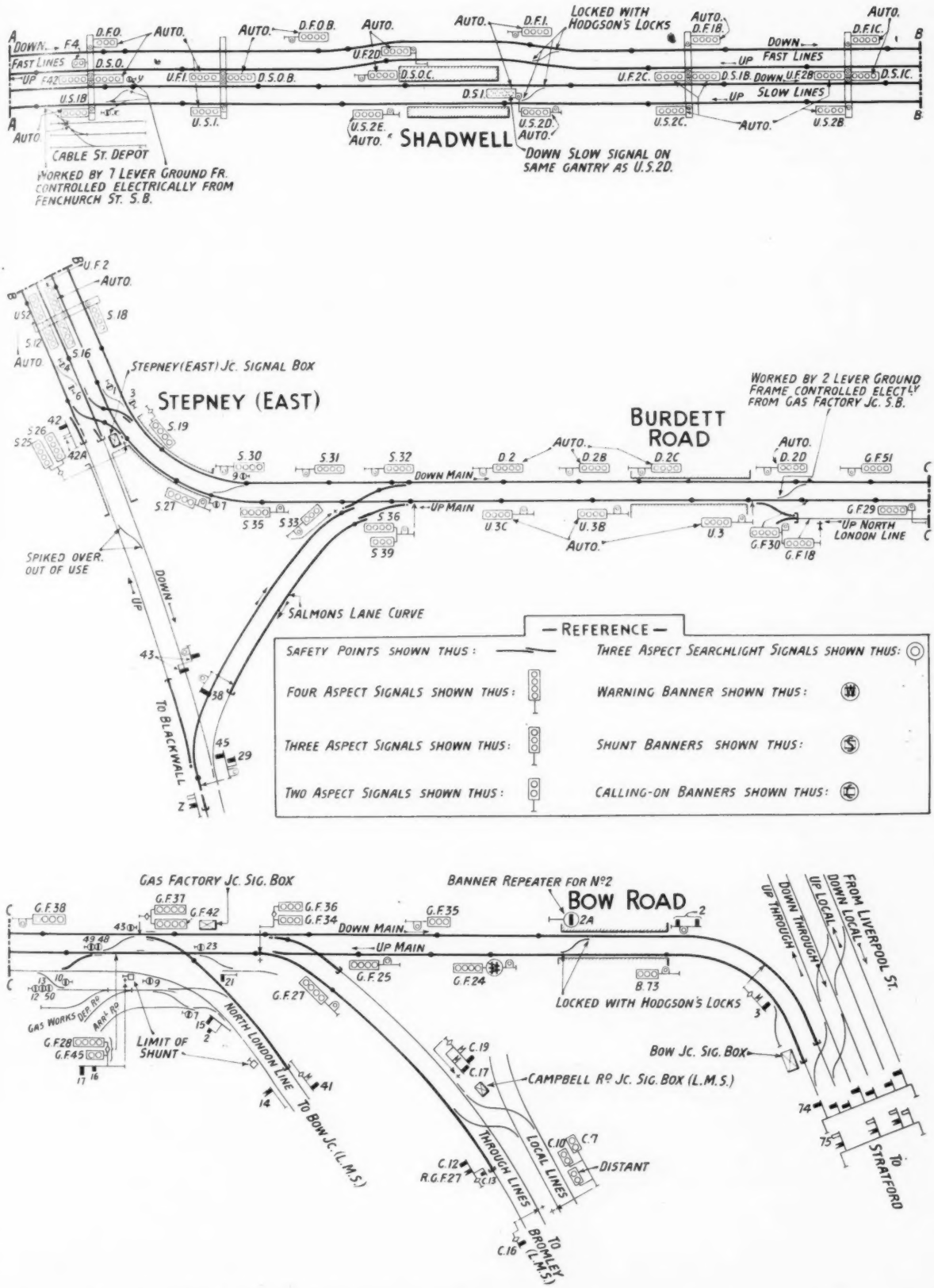
A matter of exceptional difficulty was the fact that in



Map showing railway connections in East London, with particular reference to the Fenchurch Street, Stepney (East), and Bow (Gas Factory Junction) lines now resignalled, as described in the text


5 WAY ROUTE INDICATOR
7 WAY ROUTE INDICATOR
DOWN SIGNALS ON WEST FACE OF SIG. BOX GANTRY C.D.
FENCHURCH ST
WORKED BY 3 LEVER GROUND FR. CONTROLLED ELECTRICALLY FROM FENCHURCH ST. S.B.
UP INNER HOME SIGNALS ON EAST FACE OF SIG. GANTRY E.F.
L.M.S. GROUND FRAME
HOIST ROAD
COMMERCIAL RD DEPOT (L.M.S.)
SCOTCH
ROYAL MINT ST. EAST ARR. SID.
PLATFORM No 4
" 3
" 2
" 1
ROYAL MINT ST. EAST
ENGINE STOP
DOWN SIGNALS ON WEST FACE OF SIG. GANTRY E.F.
LOCKED WITH HODGSON'S LOCKS
SIG. BOX
DOWN SLOW LINES
UP
LEMAN ST
ROYAL MINT ST. NORTH
ROYAL MINT ST. (MIDLAND)
COACTORS FOR No 3 & 4 PLATFORM STARTING SIGNALS
WORKED BY 2 LEVER GROUND FR. CONTROLLED ELECTRICALLY FROM FENCHURCH ST. S.B.
EAST SMITHFIELD
4 WAY ROUTE INDICATOR

Signalling diagram of the lines in the immediate vicinity of Fenchurch Street station; this is continued on the opposite page


SHADWELL
STEPNEY (EAST)
BURDETT ROAD
BOW ROAD
STEPNEY (EAST) Jc. SIGNAL BOX
CABLE ST. DEPOT
WORKED BY 7 LEVER GROUND FR. CONTROLLED ELECTRICALLY FROM FENCHURCH ST. S.B.
DOWN SLOW SIGNAL ON SAME GANTRY AS U.S.2D.
LOCKED WITH HODGSON'S LOCKS
WORKED BY 2 LEVER GROUND FRAME CONTROLLED ELECTLY FROM GAS FACTORY Jc. S.B.
SPIKED OVER. OUT OF USE
SALMONS LANE CURVE
TO BLACKWALL
GAS FACTORY Jc. SIG. BOX
BANNER REPEATER FOR No 2
LIMIT OF SHUNT
NORTH LONDON LINE TO BOW Jc. (L.M.S.)
CAMPBELL Rd Jc. SIG. BOX (L.M.S.)
BOW Jc. SIG. BOX
THROUGH LINES
LOCAL LINES
DISTANT
TO BROMLEY (L.M.S.)
TO STRATFORD
FROM LIVERPOOL ST.
— REFERENCE —
SAFETY POINTS SHOWN THUS:
FOUR ASPECT SIGNALS SHOWN THUS:
THREE ASPECT SIGNALS SHOWN THUS:
TWO ASPECT SIGNALS SHOWN THUS:
THREE ASPECT SEARCHLIGHT SIGNALS SHOWN THUS:
WARNING BANNER SHOWN THUS:
SHUNT BANNERS SHOWN THUS:
CALLING-ON BANNERS SHOWN THUS:

Signalling diagram, Fenchurch Street to Gas Factory Junction, continued from opposite page

the 1 m. 50 ch. between Fenchurch Street and Stepney there are four running roads, but in the important length of 82 ch. thence to Gas Factory Junction—important in that the L.M.S. Tilbury trains use that portion up to Gas Factory Junction—there are only two running lines. It became necessary, therefore, with a 3-minute headway out of and into Fenchurch Street, to provide for a 1½-minute headway between Stepney and Gas Factory Junction. By being content with a short overlap and by the provision of four-aspect signals on this two-track section, a solution of the problem has been found, and a personal inspection of the running of the trains through Burdett Road suggests that Mr. Charles Carslake (the Assistant Signal and Telegraph Engineer), who was mainly responsible for the layout of the signalling, Colonel Mauldin (the Operating Superintendent) and Mr. L. S. W. Groom (the Running Superintendent) are to be congratulated on the results of their labours in solving so difficult a problem.

The New Signal Box

The new signal box at Fenchurch Street is fixed on a gantry that spans all the tracks just outside the eastern ends of the platforms. It contains 140 levers—100 for signals, 34 for points and 6 spare—all electrically interlocked. A new and pleasing feature of the frame is that the handles, in their various colours, have been treated by the Firmoid process, the durability of which has been proved by its extensive adoption in public vehicles. The lever naming and release numbers are in a semi-transparent plate in desk form in front of the levers. These are illuminated when required by a soft light from below, and this light and the flood-lighting of the illuminated diagram are the only artificial lighting necessary for the box. The usual repeaters, " N " or " R," in lunar white, indicate the condition of the points; a red light repeats the " on " position of running signals, and " off " in lunar white indicates that the signal is at " caution " or " clear." Only the " on " position of shunt signals is repeated, by means of a red light.

Two electric locks—one covered and sealed, for the electric interlocking of the levers, and one for track locking and back-locking of the signal levers—engage with a horizontal tappet connected to the levers. Contact equipment of the levers is arranged vertically at the front and at the back of the frame, and is visible through the glass panelling. A well is provided in the centre of the frame and this gives easy access to all terminals. Behind the lever frame, and supported on pillars, is the illuminated diagram, 15 ft. long, the indications on which are of the normally-illuminated spot-light type.

On the north side of the signal box, and on the same floor level, is the relay room. The relay racks are of sheet steel construction with trough shelves. The underside of the trough is composed of individual ply-wood boards with holes drilled to correspond with the terminals of the relays on the shelf immediately below. The wires to the relays therefore appear in parallel vertical lines. All incoming and outgoing wires are terminated on sloping fuse and terminal racks beneath the shelves on the front side of the room. The whole of the apparatus in the signal box and relay room was installed and wired, tested, and brought into use within 10 weeks. Control and indication wires throughout the installation consist of single core conductors, the main feeders being twin core cables.

There are 74 point machines in use, and, generally, the facing point layouts include the British Standard facing point bolt; self-contained detection boxes are fitted. Dynamic snubbing of the motor takes place when the points have been thrown and locked, and crosses in the operating circuits are guarded against by cross-protection relays inserted at the signal box end. The crosses in the detection circuits are safeguarded by short-circuiting the detection relays in the event of the points not being either fully normal or fully reversed.

Signals of the multi-lens type have been adopted throughout for main line running signals, with the exception of the platform starting signals at Fenchurch Street, where the exigencies of space necessitated the searchlight type of signal being used. All running signals are provided with individual side-lights and a back-light for the " red " aspect. The back-light is provided for the use of men working on the line.

Due to the length of the L.M.S.R. trains which use platforms 3 and 4 in the station, and to the engines of departing trains sometimes being in advance of the starting signals, it has been necessary to provide co-acting signals of the multi-lens type. These are controlled by the same lever, but are separately indicated in the signal box.

The route indicators are of the double-sided blind type, giving very clear indications both by day and by night. The back indication serves, as at King's Cross and like the back-lights of the signals, for the use of men on the line. A banner type signal is used for calling-on purposes. The banner is operated by a tractive armature a.c. magnet and is internally lighted by night. Ground shunt signals are of the motor-operated disc type with red and green indications at night. Running signals are preceded by the ground signals applying to their respective routes, and thus a clear run is assured when a running signal is lowered.

There are altogether 55 four-aspect signals, 25 three-aspect signals and 16 two-aspect signals of the multi-lens type. Of the subsidiary signals, there are 43 of the motor disc type and 15 of the banner type. Telephones are provided very liberally to allow of quick communication between drivers and signalmen.

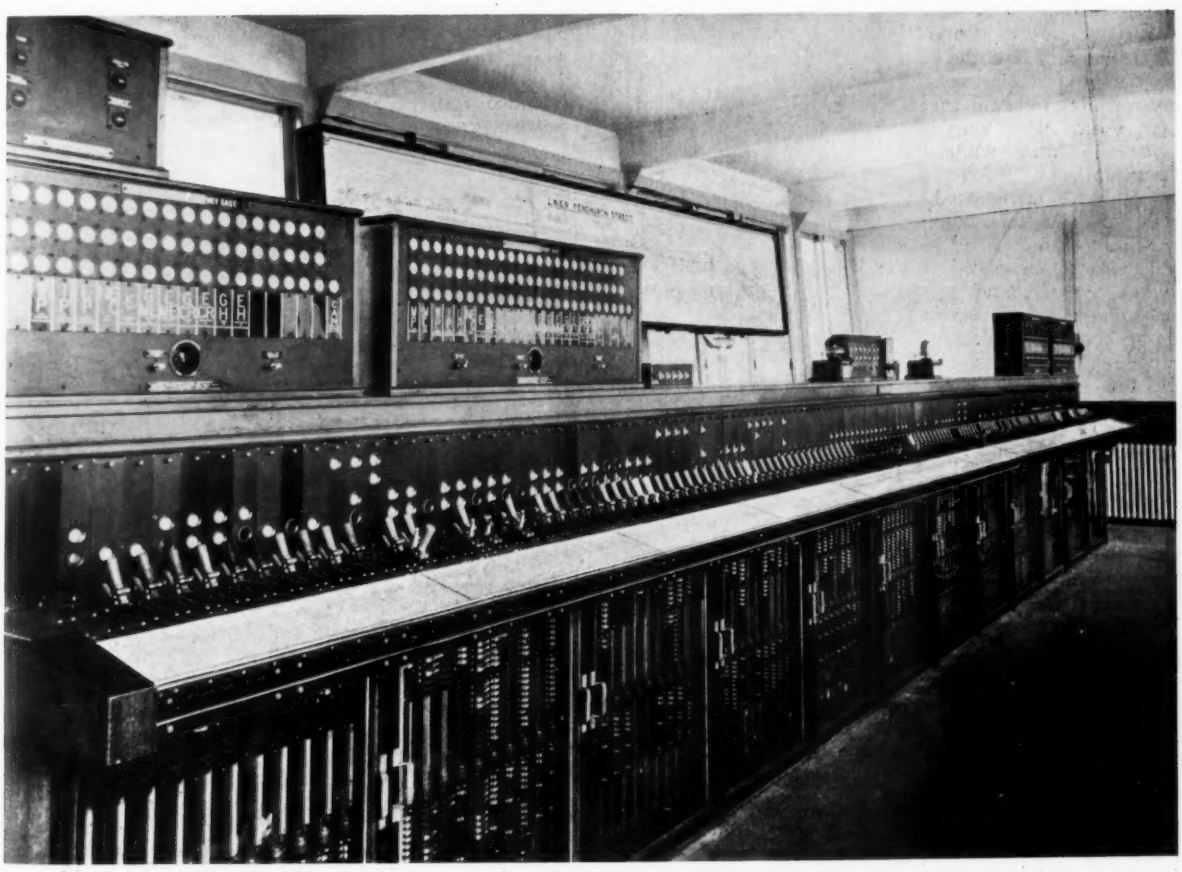
Within the area of the new signal box are five goods depôts at which controlled ground frames are provided. *Train Accepted* indicators and *Train Ready to Start* indicators are provided in the signal box and are operated from the ground frames. Where the acceptance of the train is dependent on particular conditions being fulfilled at the depôt ground frames, the train-acceptance plungers are electrically locked until the conditions are right for acceptance. Joint operation by the shunter and the signalman is necessary to cancel a *train accepted* indication. A bell is rung momentarily in the signal box when the acceptance indications are put up.

Automatically operated time element relays are used where necessary for delayed action release either on signal lever backlocks or for the display of " off " aspects of signals. There are in all nearly 800 relays of various types, including the 140 track circuit relays. The track circuits are of the condenser-fed type. At Stepney East and Gas Factory Junction 60 lever locks and circuit controllers have been fitted to the mechanical lever frame.

At Fenchurch Street the power for signals and tracks is taken off 110-V. supply mains. Point machines are operated by 110-V. d.c. The line lying beyond the Fenchurch Street control is fed by 660-V. mains with step-down transformers at each position. The main supply of power comes from West Ham.

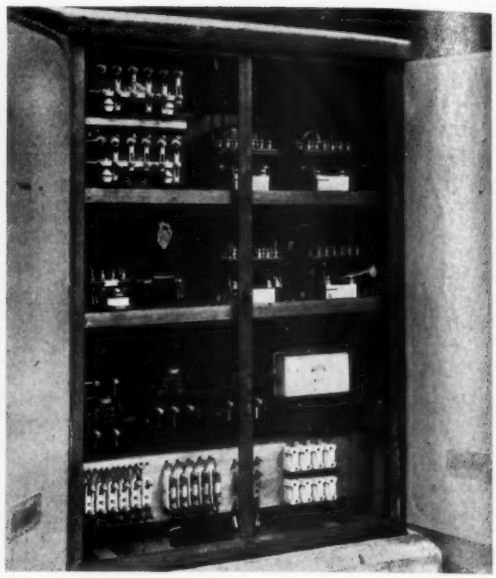
The sub-power station is at a level below the railway, and into it two feeder mains are brought, one direct and one through the railway company's sub-station. The supply is 339 V., 3 phase, 50 cycles, and Scott connected transformers are used to give an output to two single-phase circuits, one at 660 V. and the other at 110 V. These transformers are in duplicate, one always taking load, the other acting as a stand-by. The 20 kVA. stand-by set

Exterior of Fenchurch Street new signal box L.N.E.R., looking west



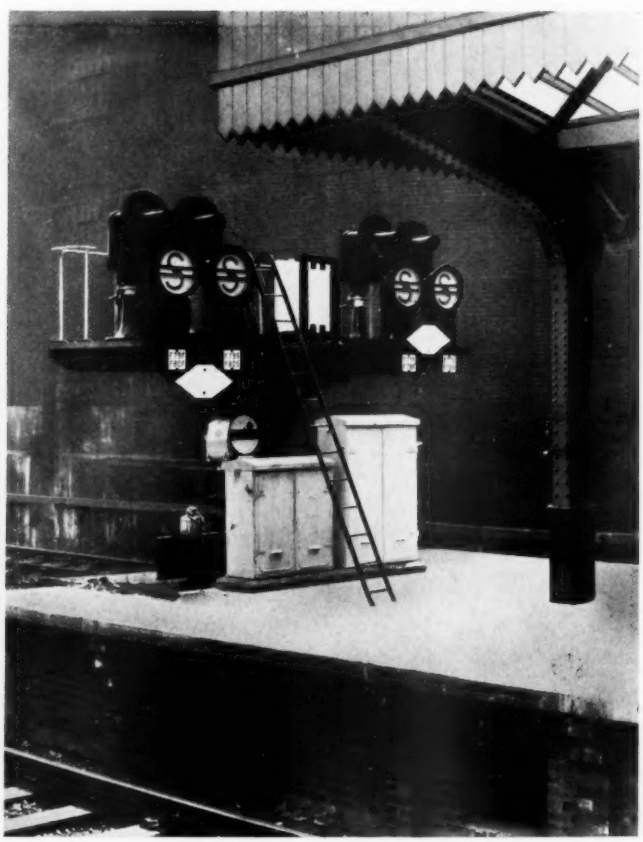
Interior of new Fenchurch Street signal box, L.N.E.R., showing relative positions of lever frame, illuminated diagram, and repeaters

Relay room in new Fenchurch Street signal box



Typical location box alongside track

Typical multi-aspect signal with route indicator



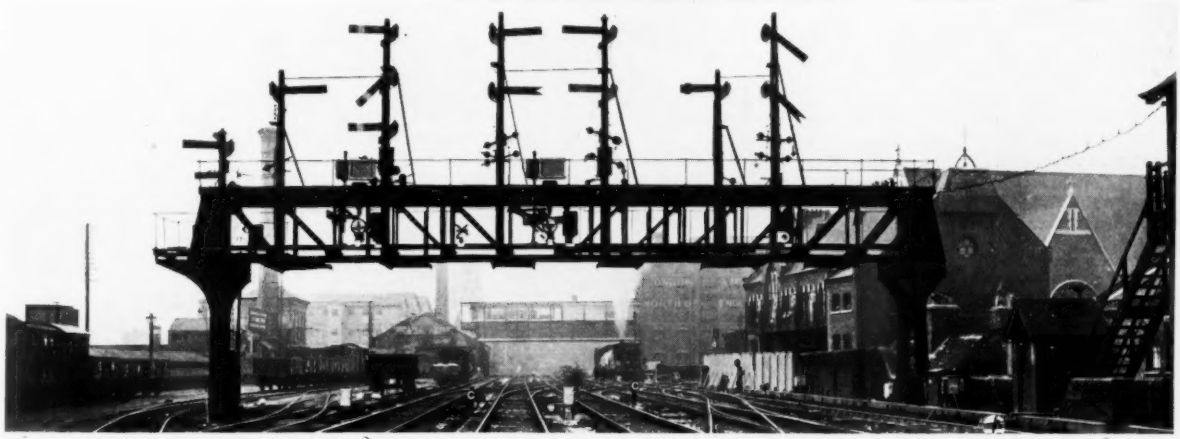
Signals at end of Fenchurch Street platforms 1 and 2

THE RESIGNALLING OF FENCHURCH STREET STATION, L.N.E.R.

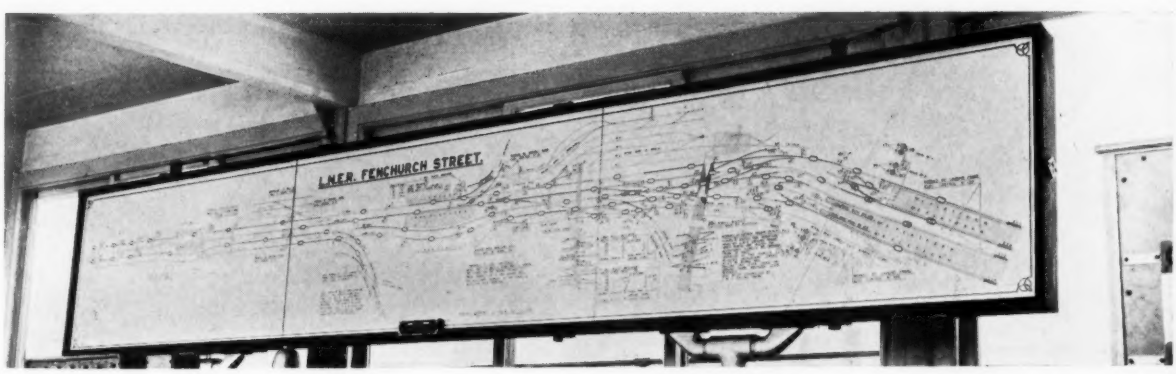
includes an alternator d.c. machine motor-generator set. This set is reversible, and can be driven either from the a.c. side to charge the stand-by battery or can be driven from the battery to supply the a.c. load to the signal circuits. This set is always running and is normally motoring from the a.c. supply and trickle-charging the battery. There is also a diesel engine alternator set which is normally standing idle, but is automatically started directly a power failure occurs on the normal supply. The alternator automatically synchronises with the alternator of the motor generator set. The signal load is then transferred to the engine set whilst the motor-generator set trickle-charges the main battery. The system is designed to prevent a drop in voltage during the change-over sufficient to affect detrimentally the operation of the signalling apparatus.

The contractor for the whole of the work except the train describing apparatus, which will be the subject of a separate article, was the Siemens & General Electric Railway Signal Co. Ltd., which worked to the plans and specifications prepared to the requirements of Mr. C. J. Brown, Engineer, L.N.E.R., Southern Area, and under the supervision of Mr. F. Downes, Signal and Telegraph Engineer. The officer directly responsible for the execution of the work was, as already observed, Mr. C. Carslake, Assistant Signal and Telegraph Engineer, to whom, in particular, we tender our thanks and congratulations.

Old signal box at Fenchurch Street station, now removed



Semaphore signals at Fenchurch Street prior to resignalling by colour lights



Illuminated panel in new Fenchurch Street signal box, L.N.E.R.

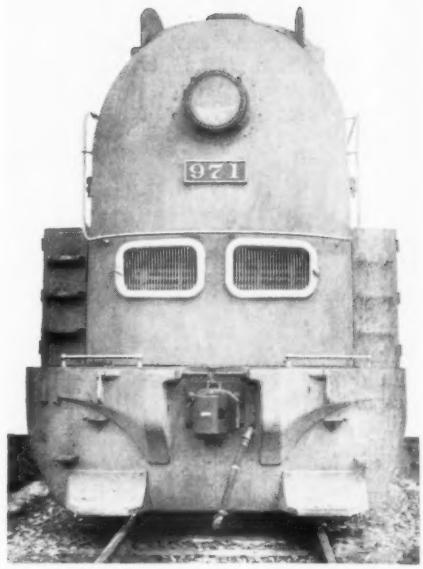
THE ASIA EXPRESS

High-speed streamlined steam train connecting Dairen and Hsinking, South Manchuria Railway

A BRIEF general description of the Asia express appeared in THE RAILWAY GAZETTE of December 7, 1934, but further details of this remarkable train have now been received. At present it covers the 701·4 km. (434·8 miles) between Dairen and Hsinking in 8½ hours, or at an average travelling speed of 82·5 km. (51·1 m.p.h.), but this is to be considerably improved in the near future. The order in which the train is marshalled is as follows: A special streamlined locomotive; one baggage and mail car; two third class passenger cars; one dining car; one second class car; and one first class observation car. When traffic is particularly heavy an additional first or second class car is added between the last two vehicles.

The principal dimensions of the locomotive are:—

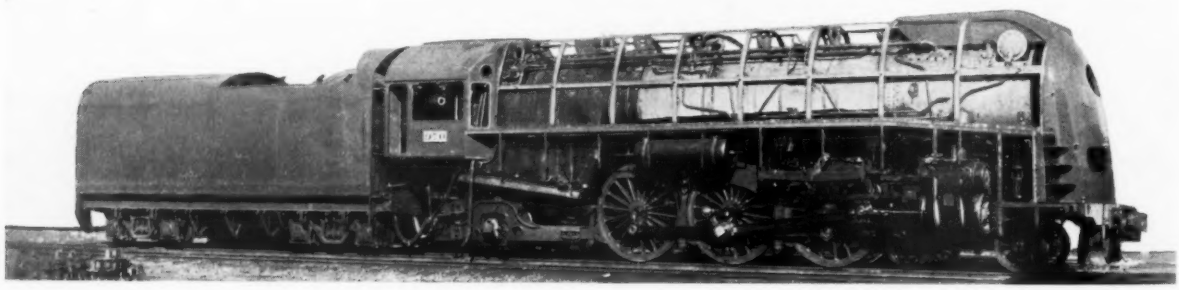
Type 4-6-2	
Cylinders (2), diameter	23⅝ in.
,, stroke	28 in.
Wheels, coupled, diameter	6 ft. 6¾ in.
,, ,, bogie	3 ft. 0 in.
,, ,, trailing	4 ft. 2 in.
Boiler pressure	228 lb. per sq. in.
Boiler (tapered)—	
Inside diameter	6 ft. 5½ in.–6 ft. 11⅞ in.
Length between tube plates	16 ft. 10¾ in.
Grate area	67·3 sq. ft.
Heating surface—	
Tubes	615 sq. ft.
Flues	2,056 ,,
Combustion chamber	283 ,,
Arch tubes	33 ,,
Total evaporative	2,987 ,,
Superheating surface	1,100 ,,
Combined total	4,087 ,,
Valve gear	Walschaert
Piston valve, diameter	12 in.
,, ,, max. travel	8½ in.
Weight in working order:—	
Engine	117 tons
Tender	83 ,,
Total	200 ,,
Weight on coupled wheels	70 tons
Tractive force at 80 per cent. boiler pressure, 36,200 lb., and at 85 per cent.	38,480 lb.
Factor of adhesion	4·51
Water capacity	9,780 U.S. gallons
Coal ,,	12 tons



Front end of Asia streamlined locomotive

Some special features are the extensive use of high tensile alloy steels and aluminium alloys to keep the weight down. A cast steel main frame and cast steel cylinders are other features. The boiler plates are of nickel steel and the brake cylinders, cylinder front covers and certain other parts are of light alloys. Special care had also to be taken in the design of the firebox, to make it suitable for the use of Fushun coal, and in designing generally to suit local conditions in Manchuria. The general trend of the design and fittings follows modern American practice in many respects and, as the dimensions show, a very powerful locomotive results.

Soft grease lubrication under pressure is used in the driving boxes and also for the big and little ends and side rods, and pressure fed oil for the bogie, slide bars and link motion. Streamlining has been worked out with great care, and the skeleton upon which the streamline sheeting is fixed consists of a channel frame, shown in one of our illustrations. The tender bogies are of the swing bolster type and the journals are equipped with Timken roller bearings. The coal bunker is fitted with an aluminium cover—which can be opened and closed easily—so as to continue the streamlining on a level with the coach roofs. A diaphragm is also fitted between the tender and the first coach, to eliminate air eddies between the two vehicles. To complete the streamlining effect,

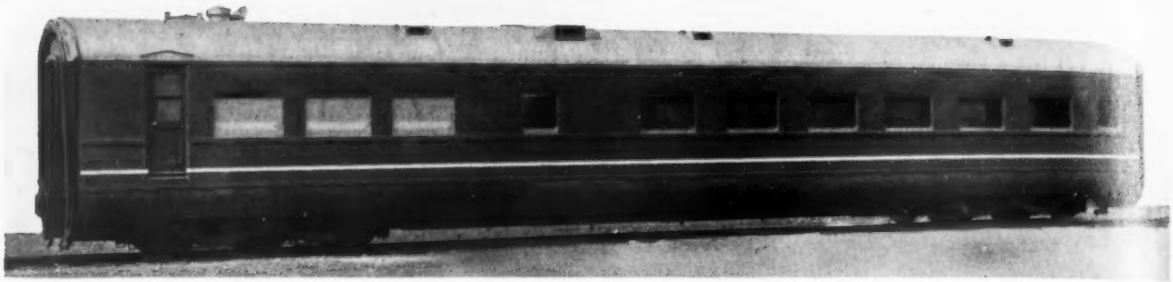


Pacific locomotive for the Asia express with streamline plating removed to show the skeleton frame upon which it is mounted

The complete train, showing the continuous streamlining throughout

Left : Interior of second class carriage, showing revolving seats, those on right turned to face windows *Right : Interior of observation parlour at the tail of the train*

THE ASIA STREAMLINED EXPRESS, SOUTH MANCHURIA RAILWAY



A dining car for the Asia express: this is typical of the streamlining of all the passenger vehicles used on that service

valances are fitted below the underframes of tender and coaches.

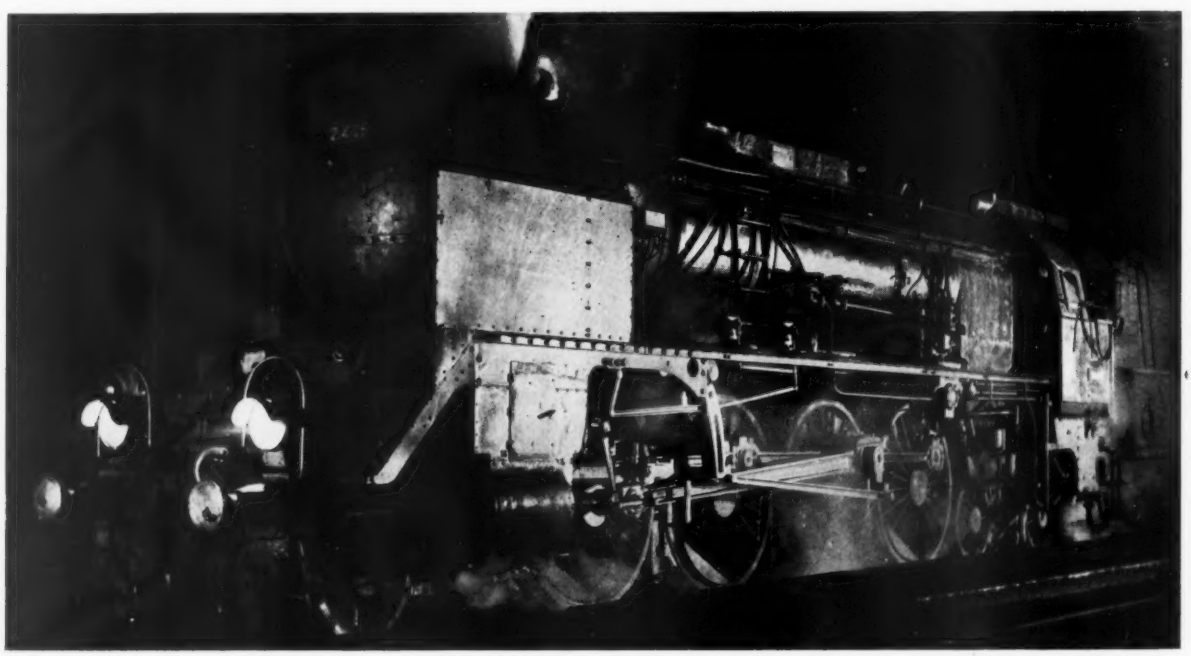
The Coaching Stock

The cars are of all-steel construction and are mounted upon American type six-wheeled bogies, with S.K.F. roller bearing axleboxes. The baggage and mail car has a mail and a sorting compartment, a lavatory, a baggage compartment and an officer's compartment. The third class cars each seat 88 and are of the open, central gangway type, with lavatories. The dining car contains a waiting compartment, a dining saloon to seat 36, a pantry and a kitchen. Fittings include a refrigerator and an oil cooking range. The second class car, which seats 68, is also of the open type, and has lavatories and a steward's compartment. One of the two first class cars, marshalled at the end of the train, has an observation parlour. Reading and writing facilities are provided, and there are ladies' and gentlemen's lavatories, a luggage compartment, and a steward's compartment. The seats in all classes are sprung, and in the first and second they can be revolved to face in either direction or to face the windows.

To minimise weight, the coach underframes are of special high-tensile steel. Floors, sides and roofs are double and insulated. The inside panelling is of walnut, maple and elm. The floors are covered with either carpet, rubber sheet or linoleum, according to class.

The windows are double and have metal sash frames. They are locked shut, for the train is completely air-conditioned, but can be opened in case of special need. The air-conditioning plant is of the steam ejector type and is of 7·5 tons capacity in the second and third, and 6 tons in the first class cars. The refrigerator units, cold water tanks, pumps, sprays, and purge ejectors are beneath the floors, but the air conditioners and their accessories are inside the lavatory ceilings. Circulation of the conditioned air is assured by a carefully arranged system of conduits.

Each car is 80½ ft. in length and 10 ft. in width, but, owing to the use of high-tensile steel and light aluminium and magnesium alloys, the tare weights vary from 40 to 54 tons only. An 8-kW. generator is fitted to each bogie with requisite battery equipment. Central automatic buffers and couplers are provided.



View at the West station, Vienna, taken at night by the light of another engine, of the large 2-8-4 locomotives used for working heavy express trains on the Austrian Federal Railways (*see editorial note on page* 955)

SIGNALLING IMPROVEMENTS ON THE AUSTRIAN FEDERAL RAILWAYS

New crank-handle locking frame for loop stations

THE financial difficulties with which the Austrian Federal Railways have had to contend in recent years have led the management to investigate the possibility of reducing operating expenses by the use of improved signalling arrangements, enabling station working to be brought under the control of fewer hands. Generally speaking, the signalling methods used for many years in Austria, as in some neighbouring countries, have resembled those prevailing in Germany, but the apparatus installed has exhibited certain individual features.

At a great many stations where passing loops were provided there were, under the older arrangements, two signal-boxes, one at each end, with some control over their working exercised by an official from the centre of the station. With the type of apparatus then used it was not possible satisfactorily to work the points at the ends of the loops from one spot under all conditions, the distance being too great, or generally thought to be so at the time. The expense of this system of working was, of course, considerable, and with the increased cost of labour after the war the necessity of discovering a cheaper one became pressing. Accordingly, electric power frames were put in, and the whole of the working controlled from one spot by the principal station official, at Erdbergerlände, Penzing, Stams Silz, Pians, Strengen, Flirsch, Pettneu, Wald, and Patsch.

The satisfactory results obtained encouraged the idea of constructing mechanical apparatus to accomplish the same thing, and the Südbahnwerk Signal Company designed a double-wire lever for operating points and detector bolts up to a distance of 600 m. (656 yd.) from the cabin. A complete frame of these levers was installed at Inzersdorf, and at several other places long-distance levers were added to the ordinary lever frames for working certain points.

Shortly afterwards, with a view to producing apparatus requiring a minimum of effort to work it, the firm of Stefan Götz & Söhne, of Vienna, constructed an improved locking frame of the crank-handle pattern, or *Kurbelwerk*, and this was installed at Kirchstetten station and brought into use in October, 1933. By permission of our contemporary the *Verkehrswirtschaftliche Rundschau*, and the makers, we are able to give the following account of the equipment. The so-called crank-handle locking frame is a familiar sight in some parts of the Continent. Instead of levers, the double-wire transmissions are operated by small barrels placed horizontally in the frame and driven direct or through gearing by large crank-handles which hang down vertically when not in use and can be pulled slightly forward to clear the others when requiring to be rotated. As the handle itself can give no indication of the fact, a pointer working with the barrel shows the position, normal or reversed, of the function concerned. The working is necessarily somewhat slower than with levers, but this is of no great consequence at the class of station usually fitted with the crank-handle frame.

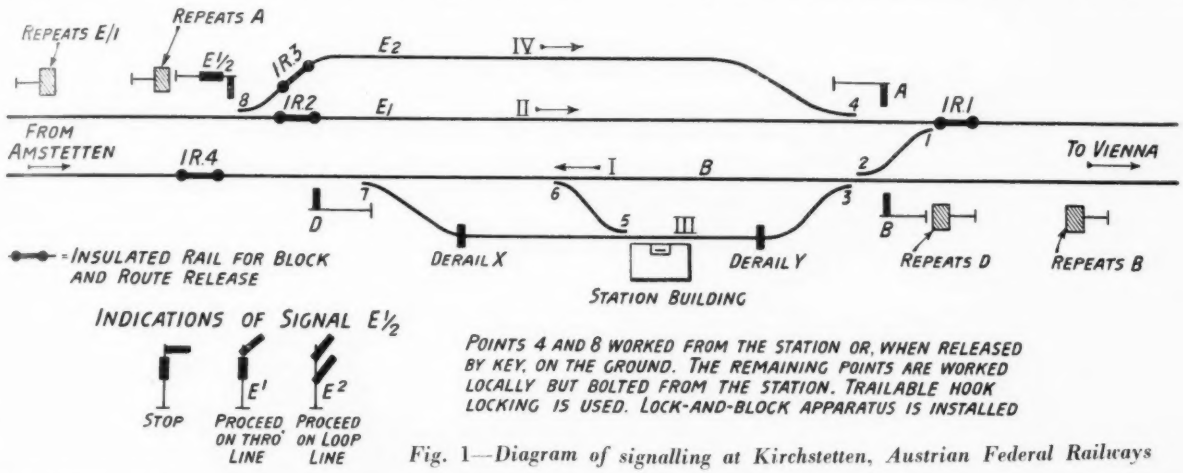


Fig. 1—Diagram of signalling at Kirchstetten, Austrian Federal Railways

The Kirchstetten Installation

The layout at Kirchstetten station is shown in the signalling diagram, Fig. 1. Points 4 and 8, on the running loop on the line to Vienna, are arranged for long-distance operation. The remainder are hand worked, being used for shunt movements only, but bolted from the frame in the station before running signals can be cleared. It will be noted that the trains are operated left-handed but that the semaphore arms are right-handed. The distant signals are discs. All the points are trailable, the Büssing type of hook lock being used, and equipped with the regulation indicator lanterns. These are driven by a special escapement mechanism, known as the Zuleger precision movement, in such a way that the lantern takes up a mid-way (45 deg.) position on the smallest movement of the operating rod, before the hook lock has unlocked the closed point tongue. This can be seen clearly in Fig. 3. Fig. 4 is a view of the locking frame. Instead of each operating barrel having a crank-handle, which is the usual practice, only one handle is provided, and is placed on the end of the shaft concerned when required. On the flat desk portion of the frame, above the spindles, indications are provided to show the condition of each one. In the case of point spindles there is an out-of-order sign in addition, which appears whenever the points are run through accidentally. When this happens an alarm bell also sounds and all signals concerned are locked until

Fig. 2—Points at Vienna end of loop being operated by hand after being released by the key from the frame. The interlocking handle is seen over the key lock above the main spindle. Lantern in 45 deg. position

Fig. 3—Points at Amstetten end of loop, showing point indicator lantern in mid-position, the facing point lock not having finished its stroke. Crossing barrier behind

Fig. 4—General view of crank handle locking frame, Kirchstetten, with block apparatus above it and key locks at each end

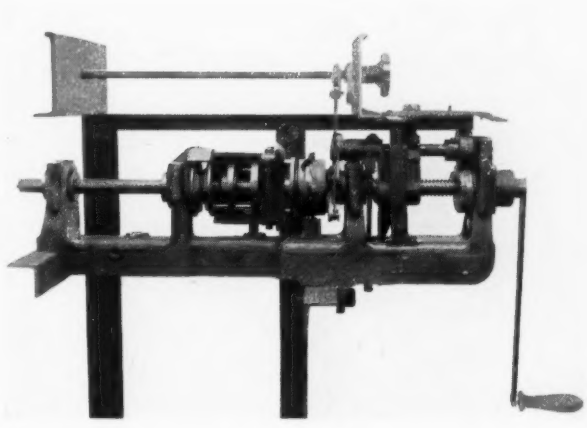
the correspondence between points and operating spindle is re-established. This is done by putting the handle on the back end of the shaft, after breaking a seal, and rotating it until the two portions, separated by the forcing of the clutch coupling, become re-engaged. Above the desk are seen some rotary handles, one of which the signalman has in his left hand, and which are turned to couple the operating portion with the remainder during movement of the crank-handle, so acting as a kind of trigger, or catch block. The electric block apparatus is mounted over the frame and interlocks with it in the usual manner. The release of the block by an arriving train is effected by " last vehicle " rail-circuit action.

The chief peculiarity of the Kirchstetten frame is the large mechanical advantage obtained with, of course, consequent slowness of working. To clear or restore a signal, four turns of the crank handle are required, and to reverse a pair of points, eight. A view of a point-operating spindle appears in Fig. 5, the trailable clutch mechanism being clearly seen next to the right-hand upright bar, and behind it the chain pulley for imparting the drive to the transmission. The points are operated by a special ground movement (Fig. 6), constructed on the differential principle, to allow of local operation by hand, for shunting purposes.

In this device the drive from the cabin comes on to the left-hand drum, over which the chain is wound. On the other side of the case is a second drum moved by the hand lever outside. Both drums are bevel wheels, between which there is a bevel pinion carried by a stud, on a central spur wheel, which is free on the main spindle and engages below with teeth in the driving rod coupled to the points. Between the two drums there is an interlocking spindle carrying cams engaging with notches in the drums and terminating in a small handle which can be seen in the picture.

Normally this handle is held locked by a key lock (seen in Fig. 2) below the little handle, and the cam spindle holds a lock in the right-hand drum. The left-hand drum is free and can be worked from the frame, imparting motion to the centre spur wheel through the bevel pinion, which travels round on the fixed drum. When the points are to be worked by hand, the key is brought from the frame, from one of the locks seen at each end in Fig. 4, and is used to unlock the little handle on the point movement, which, being turned, locks the main operating drum and frees the hand lever drum, backlocking the key. The points can now be worked by the man on the ground. When the work is done, the points are set normal, the small handle is reversed again and the key extracted from the lock and sent back to the cabin, where it is inserted in the lock there and used to release the frame for regular operation. This apparatus is very simple and of robust construction.

The new crank-handle locking frame has worked satisfactorily from the beginning and we understand that several other stations have been, or are in course of being, equipped with it in Austria and Czechoslovakia at places where centralised control of long loops promises to offer an appreciable saving in working expenses.



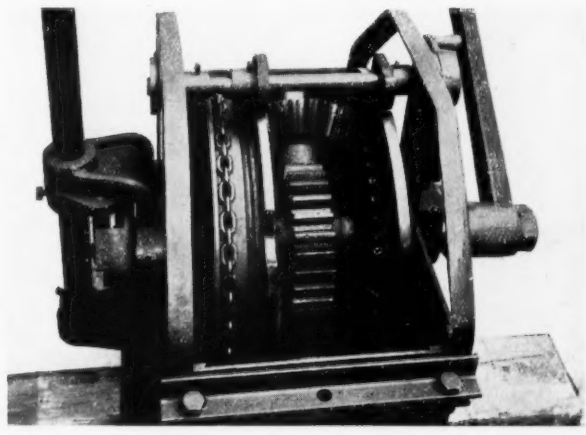


Fig. 5 (left)—Point-operating spindle in frame, showing crank handle in position, catch handle and trailable clutch mechanism. Fig. 6 (right)—Differential point mechanism for working from the frame, or locally by hand, as required. Points reversed and notch in operating drum moved away from cam on spindle of interlocking handle

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HOUSING RELAYING GANGS, L.N.E.R.

Ganger's compartment

Mess room

THERE are many remote places where permanent way work has to be undertaken to which access by the ordinary train service is impracticable and lodging accommodation is not readily obtainable. To overcome this difficulty a set of obsolete carriages has recently been converted for use in the North Eastern Area of the L.N.E.R. to house relaying gangs. The coaches are stationed in a siding as near as possible to the work, and as may be seen from the illustrations, are comfortably fitted up. Warmth is provided by closed stoves, and there is a boiler for the supply of hot water in the lavatory compartment.

A portion of one vehicle is partitioned off for the exclusive use of the ganger in charge, and here he has his own bed and wash basin and a table where he can examine his plans and make out his time sheets. Another coach is fitted up as a messroom, and is divided into two sections by a kitchen; this division is deliberate, in order to allow of some of the occupants playing games whilst others may wish to indulge in reading.

Lavatory

Sleeping van

RAILWAY NEWS SECTION

PERSONAL

As an immediate result of the approval of the Argentine Government, on April 24, to the co-ordination of the services and managements of the Buenos Ayres Great Southern and Buenos Ayres Western Railways, it is officially announced that Mr. R. Stuart and Mr. Cecil A. Roberts, General Managers of those lines, are in future to be Administrative and Technical Manager respectively, of both railways.

INDIAN RAILWAY STAFF CHANGES

Lt.-Col. R. H. Stallard, R.E., Deputy Agent, M. & S.M.R., who has recently been acting as Agent, has been granted eight months' leave as from April 23. Mr. A. C. Rose, Assistant Signal Engineer, has been appointed to act as Deputy Agent.

Mr. G. J. B. Bevan, M.B.E., Deputy Agent, Burma Railways, has been granted seven months' leave as from April 9. Mr. C. P. Brewitt has been appointed to officiate as Deputy Agent in his place.

Mr. G. M. Smith, Controller of Stores, B. & N.W.R., has been granted seven months' leave as from April 3. Mr. J. B. Haskins acts in his place.

Mr. J. A. Smith, Locomotive Superintendent, B. & N.W. and R. and K. Railways, has been granted six months' leave as from April 17. Mr. W. T. S. Cairns has been appointed to act in his place.

Mr. E. M. Slane, Chief Auditor, B. & N.W. and R. & K. Railways, has been granted 24 months' leave preparatory to retirement, as from April 11. Mr. G. D. Laurie acts as Chief Auditor.

Mr. R. E. Rutherford, Divisional Superintendent, E.I.R., has been granted 6¾ months' leave as from April 12.

Mr. A. Cooper, Officiating Chief Commercial Manager, N.W.R., has been granted leave for seven months, as from April 2.

Dr. W. D. Speedy has been appointed acting Chief Medical Officer, B.-N.R., as from March 22, vice Dr. A. M. Leake, granted leave.

Mr. E. W. Russell has been confirmed as Deputy Agent (Works), G.I.P.R., as from April 14, 1934.

Mr. H. G. Salmond, Deputy Agent (Works) and Secretary, E.B.R., has been granted 6½ months' leave, as from April 4.

General W. W. Atterbury, President of the Pennsylvania Railroad, has resigned, and Mr. M. W. Clement, formerly Vice-President and, since July last, Acting President, has been elected to succeed him.

General Atterbury was born in 1866; graduated at Yale as B.Phil., and also joined the Pennsylvania Railroad as an apprentice in Altoona shops in 1886; he worked his way up in the Mechanical Department until, in 1901, he became Superintendent of Motive Power, Lines East of Pittsburgh and Erie. Two years later he was appointed General Manager of those lines, and in 1912, he was elected Vice-President (Operation). During the war he was Director-General of Transportation of the American forces in France and was gazetted a Brigadier-General: He was awarded the American D.S.M., was made a Commander of the Legion of Honour (France), a C.B. (Great Britain), and a Commander of the Crown (Belgium). General Atterbury was elected President in 1925.

General W. W. Atterbury,

President of the Pennsylvania Railroad, 1925-1935

Mr. M. W. Clement was born in 1881 and joined the Engineer's Department of the United Railroads of New Jersey —now a constituent of the P.R.R.—in 1901. Nine years later he became Supervisor in the office of the General Manager, and was promoted to be Division Engineer in 1916. In 1917 Mr. Clement was appointed Superintendent of the New York, Philadelphia & Norfolk and, a year later, of Freight Transportation, P.R.R. Eastern Lines: Just afterwards he acted as Superintendent of Passenger Transportation. In 1923 he became General Manager, Central Region, in 1923 was elected Vice-President (Operation), and in 1933 General Vice-President.

Mr. J. Montague Eddy, C.B.E., a Director of the B.A.G.S. and B.A. Western Railways and other South American concerns, arrived in Buenos Aires on April 23 on a business visit.

Major R. K. Hubbard, O.B.E., Stores Superintendent, Central Argentine Railway, returned from European leave on April 12.

Mr. F. L. Creswell, M.Inst.C.E., Chief Engineer, Buenos Ayres Great Southern and B.A. Western Railways, arrived in England on leave on May 8.

Mr. A. B. Chanter, Traffic Manager of the Tanganyika Government Railways, has retired from the service.

Mustapha Hamdy El-Kattan Bey, Chief Engineer, Way and Works, Egyptian State Railways, is now on leave preparatory to retirement.

Dr. R. J. L. Sladen, late Chief Medical Officer, Great Indian Peninsula Railway, whose death we announced in our issue of March 1, left estate valued at £12,564 (£8,461 net).

We regret to learn of the recent death of M. Jean Ott, inspecteur général des ponts et chaussées et chef des services techniques du c. de fer Metropolitain, Paris, in his 57th year. Entering the service of the City of Paris in 1912, he had assisted in the construction of numerous lines of the Paris Metro under the direction of M. Bienvenüe, whom he succeeded on January 1, 1933.

Mr. I. C. Geddes, son of Sir Eric Geddes—who is Chairman of the com-

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pany—and the Hon. Esmond Harmsworth, son of Lord Rothermere, have been appointed Directors of Imperial Airways, Limited.

Mr. W. J. Thomas, who, as announced in THE RAILWAY GAZETTE of

Mr. W. J. Thomas,
Appointed a Deputy Chief Docks Manager, G.W.R.

May 10, has been appointed a Deputy Chief Docks Manager, G.W.R., has had shipping experience at Cardiff throughout his career and was for many years Marine Superintendent of the Foster Hain Steamship Co. Ltd. In 1924 he joined the G.W.R. as Engineer-Assistant to the Marine Superintendent, but two years later, when the Marine and Docks Departments were amalgamated under the control of the Chief Docks Manager, he became Chief Marine Assistant. Mr. Thomas was subsequently promoted to be Marine Manager, the position he now vacates to become a Deputy Chief Docks Manager.

INSTITUTION OF CIVIL ENGINEERS

At the ordinary meeting on April 30, the following elections of associate members *inter alia* were reported: Messrs. I. A. Cram, L.N.E.R.; M. Harbottle and J. C. V. Thompson, B.Sc., L.M.S.R.; A. Morton, B.Sc., G.W.R.; and C. E. C. Townsend, B.Sc., Southern Railway. Mr. G. C. Minnit, G.I.P.R., India, has been transferred from associate member to member.

INSTITUTE OF TRANSPORT METROPOLITAN GRADUATE AND STUDENT SOCIETY

The following officers and members of the committee were elected at the annual general meeting on May 7, and will take office on October 1 next:—C. A. Dove (Chairman), G. H. Searle (Vice-Chairman), C. F. King (Honorary Secretary), W. G. Coles (Honorary Treasurer), C. A. Butts and G. W. Lukins (Honorary Auditors). Committee: A. G. Course, R. M. Wheatley, G. H. Foster, F. R. Tyler, R. R. Joll, J. M. Leighton-Bailey, S. Budworth, D. W. Aldred, J. A. Williams, G. J. Ponsonby.

We regret to learn of the recent death, by drowning, of Sir Thomas Henley, K.B.E., sometime Minister of Works & Railways, New South Wales.

Mr. J. G. Batey has been appointed President, and Mr. W. C. Davenport Vice-President of the Associated Society of Locomotive Engineers and Firemen.

THIRD INTERNATIONAL RAIL CONGRESS, BUDAPEST

We are now able to publish the following provisional list of the papers to be presented at the Rail Congress at Budapest on September 8 to 12, and the authors:—

1. GENERAL QUESTIONS.
   Authors:
   Dr.-Ing. R. Kühnel.
   Prof. Dr.-Ing. E.h.F. Körber and Dr.-Ing. I. Mehovar.
   Prof. Dr.-Ing. E.h.M. Ros and Dipl. Ing. A. Eichinger.
   Dr.-Ing. W. Titze.
   Prof. C. Teodorescu.
   Dipl. Ing. B. Absolon and Dr.-Ing. I. Feszczenko-Czopiwski.
   Dr.-Ing. S. Gállik and Obering G. Hoensch.
2. WEAR.
   Authors:
   H. Araki and S. Saito.
   S. Saito and N. Yamamoto.
   Dipl. Ing. L. Szeless.
   Dr.-Ing. K. Schönrock.
   Ing. M. Spindel.
3. BRITTLENESS, INTERNAL STRESSES, AGEING
   Authors:
   Prof. Dr.-Ing. E. H. Schulz.
   H. H. Munro.
   Dr.-Ing. J. Bartel.
4. WORKING RESULTS.
   Authors:
   V. Herwig.
   Prof. Dr. mont. R. Walzel.
5. STRUCTURAL QUESTIONS.
   Authors:
   Dr.-Ing. J. Szemere.
   Dipl. Ing. W. Hüttner.
6. WELDING.
   Authors:
   V. Herwig.
   Prof. C. F. Keel.
   Dipl. Ing. Th. Nowak.
   Dipl. Ing. P. Tulacz and Direktor F. Golling.
   Ing. Z. Dobrowolski.
   Dipl. Ing. D. Csillèry.
   Dr.-Ing. G. Kazinczy.

Dr.-Ing. R. Kühnel and Herr V. Herwig are members of the German State Railway, and Messrs. H. Araki and S. Saito of the Japanese Government Railways. Mr. H. H. Munro represents the Sperry Company of Paris, and the other authors appear to be connected with various steel-making concerns.

All enquiries should be addressed to Prof. Dr.-Ing. V. Mihailich, Magyar Anyagvizsgálók Egyesülete, Budapest XI., Müegyetem.

NEW LIVERPOOL DISTRICT STATION.—The L.M.S.R. is to provide a new passenger station at Booker Avenue, between Mossley Hill and Allerton stations on the line from Liverpool to Runcorn and the South. Construction work is beginning immediately.

Sir Robert Horne, Chairman, G.W.R., among the spectators at the Final Ambulance Competition at Paddington (*see last week's issue, page* 945)

French Summer Train Services

(*See editorial note on page* 954)

Important improvements of service, in most cases involving considerable acceleration, came into force with the introduction in France on May 15 of the summer train services. For some of the notes which follow we are indebted to our French contemporary *Transports*.

Nord

On the Nord system the most striking development is the cut in the times of the *Oiseau Bleu* Pullman Express to the level three hours for the journey between Paris and Brussels. The distance is 193·1 miles, and the average speed of 64·4 m.p.h. so entailed is one of the highest in the world over a run of such length; on the northbound run Aulnoye, 133·9 miles from Paris, is booked to be passed in 119 min., requiring an average of 67·5 m.p.h. for the French section of the journey. The weight of this train owing to Brussels Exhibition traffic may be expected to rise to 400 to 450 tons, so that considerable demands will be made on the locomotives. Engines of the rebuilt Paris-Orleans Pacific type are used on this service. The 4.40 p.m. boat service from Paris to London is altered to leave at 4.30 p.m., and to reach Victoria at 11.0 instead of 11.5 p.m., but is still the fastest service of the day; on the French side the fast timing of 132 min. for the 140·5 miles from Paris to Etaples remains unaltered. The 10.30 a.m. boat train from Paris to Boulogne, which will now bring the through sleeping cars of the accelerated Rome Express service, and may be expected to rise in weight to as much as 660 tons at times of pressure, is decelerated in consequence from 163 to 174 min. for the run of 157·5 miles from Paris to Boulogne, including a 2-min. stop at Etaples. In the reverse direction the 5.35 p.m. from Calais to Paris, hitherto non-stop, in connection with the 2 p.m. boat service from Victoria, now calls daily at Boulogne (Tintelleries), and reaches Paris at 8.49 instead of 8.46 p.m. An acceleration by 5 min. of the high speed diesel train leaving at 4.30 p.m. will bring it into Lille in 2 hr. 40 min., and notwithstanding the diversion into and out of Amiens (which brings the journey distance up to 160 miles), will provide the fastest service of the day. It may be added that extensive works about to be begun between Paris (Nord) and Joncherolles, extending over 5 miles, will make timekeeping more difficult on all bookings into and out of Paris over the Nord main line, which explains the extra time of 3 to 4 min. allowed into Paris on several services, such as the southbound Golden Arrow, now due at 5.43 instead of 5.40 p.m.

Etat

On the Etat system the most interesting event is a new cross-country Bugatti service on the Dieppe-Rouen-Le Mans-Angers-Nantes route, giving a series of useful connections to various parts of this ramified system. Leaving the Maritime station at Dieppe at 5.54 a.m., and Dieppe Gare at 6.5 a.m., this will reach Nantes at 11.18 a.m. (using P.O. metals from Angers to Nantes), there connecting with the Côte d'Emeraude-Pyrenées *rapide*, arriving at Bordeaux at 4.31 p.m., Biarritz at 7.49 p.m., and with through connection to Irun and Spain. Passengers for the south-west of France will thus be able to leave London at 8.20 p.m. via Newhaven-Dieppe (and sleep comfortably on board till after 5 a.m.) instead of at 7.15 p.m. via Southampton-St. Malo, and make the same connection. A corresponding service is given by the railcar in the opposite direction, leaving Nantes at 6.35 p.m. (in connection with the 12.32 p.m. from Bordeaux), and reaching Dieppe Gare at 11.47 and the Maritime station at 11.57 p.m., connecting directly with the Newhaven boat. The distance covered by this railcar in each direction daily will be 313 miles, and the time taken 5 hr. 13 min., which works out at precisely 60 m.p.h. inclusive of seven stops, and over a cross-country route of considerable intricacy. Connections to various parts of western France are given from the junctions *en route*, as, for example, by railcar at Alençon to and from the popular spa of Bagnoles-de-l'Orne. As regards the main lines, the overall time of the two daily railcar services between Paris and Havre is brought down to the level two hours for the 141·5 miles; the 86·6 miles between St. Lazare and Rouen are allowed 73 min. down and 74 min. up, and the 54·9 miles between Rouen and Havre 46 min. down and 45 min. up, and the schedule last-mentioned, which works out at 73·2 m.p.h. from start-to-stop, is the fastest in France. Over the same route three steam-hauled *rapides* now cover the 86·6 miles from Rouen into Paris in 83 min., as compared with one previously, and additionally to one in the down direction. One of the former connects with the boat train from Southampton, and this service is thus expedited by 25 min., arriving in Paris at 9.49 instead of 10.14 a.m. To Trouville-Deauville the two previous two-hour summer services with Bugatti railcars will be supplemented by a further service with a larger unit in 2 hr. 18 min. both ways daily, carrying second-class as well as first-class passengers. On Saturdays (down) and Mondays (up) a special non-stop railcar service will operate between Paris and Dieppe in the unprecedented time of 1¾ hr., the distance via Pontoise being 105 miles. Railcars are responsible for many other substantial quickenings, providing in particular better connections with main line *rapides* from various junctions to the many seaside resorts served by the Etat. Considerable additions are made to the suburban service between Paris (St. Lazare), Poissy, and Mantes, 27 new trains being added to the timetable. This additional service is worked by fast three-car push-and-pull trains.

P.O.-Midi

Revolutionary accelerations take place along the Central France main line of the Paris-Orleans-Midi system as a result of the extension of the electrification from Vierzon to Brive-la-Gaillarde, which gives continuous electric working over the 313 miles from Paris to Brive. As a result, Toulouse, 445 miles away from Paris, is brought within roughly 10 hr. of the capital by a number of trains, whereas previously only the Barcelona Express observed such a time over this most difficult route. The 9.10 p.m. from Paris (Quai d'Orsay) is held until 10 p.m., in order to connect with the 2 p.m. service from London, but reaches Toulouse at 8 a.m. instead of 9 a.m.—an overall time of 10 hr. precisely, and an acceleration of 1 hr. 50 min.; to Port Bou the total acceleration is 2 hr. 13 min. The fastest train in this direction is still, however, the Barcelona Express, which is accelerated 11 min. on its journey from Paris to Port Bou. In the reverse direction a new express leaves Toulouse at 8.30 a.m., reaching Paris at 7.10 p.m.; while the 10.30 a.m. from Toulouse starts at 1.25 p.m., making many valuable new connections from southern France, and arrives at 11.35 p.m.—an acceleration of 40 min. There are many other substantial quickenings over this route. On the Bordeaux line the Sud Express has its schedule from Paris to Bordeaux pared by yet another 6 min., now covering the 362·0 miles in 349 min., inclusive of four intermediate stops, which reduce the actual running time to 340 min. The fastest point-to-point schedule, and the fastest steam-operated run on the mainland of Europe, is from Poitiers to Angoulême, 70·0 miles in 60 min. As to other trains, the Pyrenées-Côte d'Argent night express is accelerated by 19 min., now taking 7 hr. 29 min. from Paris (Austerlitz) to Bordeaux; the 9.10 p.m. down is accelerated by 42 min., and the 7.53 p.m. from Bordeaux will leave at 8.20 p.m., but gains 45 min. on the journey.

P.L.M. and other Services

On the P.L.M. an important development is the extension of the 1 p.m. express from Paris, hitherto running only to Lyons, as far as Marseilles; previously the latest departure from Paris to reach the Mediterranean coast the same day has been at 11.45 a.m. The 1 p.m. has been accelerated to reach Lyons at 7.23 p.m., and will arrive in Marseilles at 11.50 p.m. In the reverse direction the express hitherto leaving Lyons at 10.40 a.m. will leave Marseilles at 6.25 a.m., and Lyons at 11.5 a.m., reaching Paris at 5.40 p.m. On the Bourbonnais line a new evening express is run from Clermont-Ferrand to Paris at 5.40 p.m., and from

Vichy at 6.50 p.m., reaching Paris at 11.22 p.m.

There are no very notable changes on the Est and Alsace-Lorraine systems, but various minor quickenings have been effected. For example, the 7.15 a.m. (now 7.25) from Paris to Strasbourg is speeded-up by 12 min. to Bar-le-Duc, making this run of 157·5 miles in 162 min. During the height of the season the previous 8.42 a.m. express for Strasbourg will leave at 9 a.m., and make the non-stop run to Bar-le-Duc in 151 min. The non-stop run to Nancy of the 5.37 p.m. express from Paris is cut by 5 min. to 231 min. for the 219·0 miles. On the Belfort line the principal cut in time is of the Swiss express, hitherto leaving Belfort at 4.36 p.m., which will be accelerated by 26 min., taking 4 hr. 57 min. instead of 5 hr. 23 min. for the 274·9 miles. Much attention has also been devoted to the cross-country French services, many of which have been considerably accelerated, as, for example, by 48 min. in the case of the Lille-Dijon service, 51 min. between Bordeaux and Sète by one important service while a new evening express is run between Port Vendres, Toulouse, and Bordeaux in connection with the Algerian boat.

London Passenger Transport Board Bill

As briefly explained last week on page 948, the London Passenger Transport Board Bill came on Tuesday, May 7, before a Select Committee of the House of Commons, of which Sir Henry Cautley is Chairman. In the Bill powers are sought to construct important new works estimated to cost £9,596,000, and for additional borrowing powers of £10,000,000. Additional clauses recently inserted propose to enable the board to close its accounts in respect of each financial year on the basis of setting aside out of the revenue for each year to an interest suspense account for such year a sum estimated to cover further obligations in respect of transferred undertakings, and to provide for payment of interest on C stock within three months—or such extended period as the Minister of Transport may allow—after the end of each financial year. The proposed new works include quadrupling the Metropolitan Line between Harrow and Rickmansworth, and extending electric traction thence to Amersham. A tube railway connection is planned, 2·14 miles in length, between the Metropolitan Line near Finchley Road and the Bakerloo Line near Baker Street, so as to enable a through service of tube trains to be provided between the Elephant and Castle and the Metropolitan main line via the West End of London. Stations on the new section are proposed at Swiss Cottage and Acacia Road, and there will be extensive reconstruction at Baker Street.

The Uxbridge branch, which at present terminates in Belmont Road, a short distance to the north of High Street, Uxbridge, is to be extended to the High Street, where a new railway, bus, and coach station will be constructed with a frontage on the main road designed to provide interchange facilities with the bus and Green Line coach services.

At each end of the District Line section of the Inner Circle extensive station and track reconstructions are proposed. Aldgate East station is intended to be re-sited at the junction of Commercial Road and Whitechapel Road, and to have an island platform 425 ft. long which will facilitate exchange in the event of the Inner Circle service being discontinued. On the western side of the Inner Circle, it is proposed to carry the circle tracks at Cromwell Road, Kensington, under the District main line by means of a burrowing junction, and also to rearrange the tracks so as to bring the Inner Circle line into the centre platforms at South Kensington. Powers are also being sought to establish approximately 58 miles of trolleybus route, mainly in East London, of which 43 will be conversions of existing tramways and abandonment of the lines; 7 miles will be made available for dual operation (either by tramcar, or trolley bus); and 8 miles comprise the Tottenham link up, a new docks line through Silvertown, and extensions beyond existing tramway termini so as to serve new areas or provide suitable turning circles. Last session the board obtained power to convert 87 miles of tramways to trolleybus routes. Opposition was offered by the Abbey Road Building Society to the route of the proposed tube scheme on the ground that it might endanger the tower of Abbey House and interfere with its artesian wells, and the owners of a block of flats at South Kensington feared that their property would be injured by some of the proposed works.

Mr. Frank Pick, giving evidence on May 8 in support of the Bill, said it was very desirable that Baker Street should cease to be a terminal station. The Metropolitan Line was not being used to its full capacity. From thirty-seven stations they had only 35,000,000 passengers a year, whereas on the Edgware line they got 66,000,000 passengers from fifteen stations. That was because in the latter case there was a regular interval service on which people could count, whereas on the Metropolitan Line they had to look up a timetable. The time occupied on a journey was also an important factor. People objected to a journey of more than 30 minutes, and if that time were exceeded, traffic diminished. They hoped to build up a regular interval service as far as Amersham, which could be reached by fast trains in thirty minutes. On the question of finance, Mr. Pick said that they were assuming a fifty per cent. increase in the traffic on the Metropolitan Line, which would give them 17,500,000 more passengers. That assumption was in accord with past experience, and it would be sufficient to justify the expenditure. The estimate ought to be realised within five years.

The Committee adjourned until May 14, when Mr. Pick said with reference to possible damage to Abbey House, that there had been so many improvements recently in the construction and equipment of tubes, that there was less trouble and less vibration generally. Trains today were lighter per passenger carried. In reply to a question by the Chairman whether there was any likelihood of Marylebone ceasing to be a main line terminus, Mr. Pick said that the L.N.E.R. was likely to make bigger use of the station. He could not commit himself, but a matter being discussed was whether the L.N.E.R. should take over the services to Aylesbury so that the board's services would end at Amersham, where there would be interchange of passengers. The proposals in the Bill were not a gamble but a business proposition. They would make it possible to use the Metropolitan Line to better advantage. (*See editorial note on page* 953.)

Sir Harley Dalrymple-Hay, Consulting Engineer, giving evidence on engineering details, said that the Piccadilly tube was put right under the heavy clock tower at King's Cross and no damage had resulted. He did not think subsidence would occur in the case of Abbey House. Mr. G. L. Vigers, Surveyor, said that in the last twenty-four years 30 miles of tube railway tunnels had been constructed, and the total amount paid by the railways for structural damage in that time was only £11,535.

On May 15 the case for the opponents was opened with the evidence of Mr. R. Blake, Consulting Engineer, who explained the special arrangements at Abbey House caused by the fact that the old Westbourne brook used to flow at this spot. The building would, therefore, be very susceptible to damage even on a slight movement of the subsoil. The Committee were unable to accept Mr. Blake's plan for an alternative layout of the new tube.

In the case of the Abbey Road Building Society, due to the exceptional weight of the building the committee yesterday decided that the L.P.T.B. should allow the society three years in which to make its claim instead of the conventional two years. Counsel for the board said he would be willing to give this undertaking. In the case of Douglas Mansions, the committee decided that the railway must be at least 60 ft. away and not raised more than 8 ft. No compensation was given, but the bridge carrying the raised track must be made of concrete, and noise absorbent must be used under the sleepers. The committee will meet on Wednesday of next week.

Parliamentary Notes

Indian Railway Administration

The House of Commons in Committee on May 14 discussed proposed amendments to the eighth schedule of the Government of India Bill. This schedule provides for the constitution of the Federal Railway Authority already set up by the Bill.

In regard to the first subsection of the schedule, which deals with the appointment of seven persons to constitute the Board, Mr. Dobbie moved an amendment that one of such persons should be appointed by the Governor-General, after consultation with the All-India Railwaymen's Federation, as a representative of the workers in the industry. He said that two or three times an endeavour had been made to get real recognition of the railroad workers' union in India. There were 100,000 of such workers or half the trade union movement in India. He would be glad if the Minister would say something with regard to a recommendation in 1931 of the Royal Commission on Labour in India as to the setting up of machinery of negotiation on behalf of the railwaymen comparable with the machinery in operation in this country. That would react to the benefit of those who controlled the railways as well as of those who worked on them.

Mr. Davidson (Chancellor of the Duchy of Lancaster) stated that he was not able on behalf of the Government to accept the amendment. Conditions of labour in India and its stage of development did not in any way resemble the conditions reached in this country. To make the provision mandatory might produce very unfortunate results. On the other hand, the existing provisions would appear to enable the appointment to be made of any suitable representative of labour to the board, and probably as an additional commissioner to deal with the executive side of the work. It was wise to leave the discretion to the Governor-General. If it happened at some time that some representative clearly able to speak for those working on the railways was a suitable man for the appointment, the appointment might well be made.

In the course of discussion, Mr. Edward Williams contended that the schedule was drawn up in such a way as to debar a workers' representative from appointment.

Sir Donald Somervell (Solicitor-General) said that in the view of the Government it was quite clear that someone who had been a worker on the railways and afterwards had experience in administration in connection with organised labour, would be qualified under the two heads of industry and administration. Ultimately, Mr. Davidson said that while he did not give a specific assurance that the Government were prepared to add any words to make the meaning clear, he could say that the Government would look into the matter before the report stage of the Bill. The amendment was then negatived.

The Solicitor-General moved to insert a provision that the Governor-General might make rules providing for the appointment of temporary members to act in place of any temporarily unable to perform the duties of their office. The amendment was agreed to, as were some minor or drafting amendments moved by the Solicitor-General.

Mr. Butler (Parliamentary Secretary, India Office) moved an amendment providing that the Chief Commissioner of Railways should be appointed by the Governor-General exercising his individual judgment after consultation with the Authority. The object was to make clear what was the intention. Mr. Morgan Jones objected to the amendment because of what he said was a steady tendency to concentrate unduly heavy responsible duties in the hands of the Governor-General. After some debate, the amendment was adopted, and the schedule was agreed to.

The House subsequently considered the fourteenth schedule to the Bill, which deals with the appointment of members of the Burma Railway Board, as set up by the Bill. After a few minor amendments moved by the Solicitor-General had been adopted, the schedule was agreed to.

Questions in Parliament

Railway Rating for Valuation

Mr. Batey on May 9 asked the Minister of Health if he was aware that many local authorities were alarmed at the policy of the railway companies in seeking to avoid payment of local rates; and whether it was the intention of the Government to take the necessary steps to see that railway companies continued to pay local rates.

Sir Hilton Young: The hon. member no doubt has in mind recent judicial decisions in the cases of the Southern Railway and the London & North Eastern Railway. I am aware that those decisions have caused some concern, but they are at present subject to appeal and I am not in a position to make any statement until the appeals have been decided.

British Loan to Chinese Railway

Mr. Moreing on May 13 asked the Secretary of State for Foreign Affairs whether His Majesty's Minister had made any representations to the Chinese Government requesting an early payment of principal and interest on the British loan for the construction of the Shanghai-Fengching section of the Shanghai-Hangchow-Ningpo Railway; and, if so, with what result.

Mr. Eden (Lord Privy Seal) replied: The loan in question was for the redemption of a mortgage. Repeated representations have been made, but I regret to say so far without result.

Palestine Station Improvement

Mr. Janner asked the Secretary of State for the Colonies if he was now in a position to give an assurance that the necessary improvements in storage facilities in the railway stations and ports of Palestine would be carried out by the forthcoming autumn, in time for the first shipment of citrus; and what was the estimated amount of the expenditure on this work for the current year.

Sir Victor Warrender (Vice-Chamberlain of the Household), who replied, referred the hon. member to answers given on February 27 and 28 last, and added: It is proposed to provide considerable sums for the construction of storage sheds during the current year, but the final figures are not yet available.

Mileage of Electric Railways

Mr. West asked the Minister of Transport how many miles of British railways were electrified in 1900, 1910, 1920, 1930, and today.

Captain Hudson (Parliamentary Secretary): The route miles of electrified railways in Great Britain at the end of the years 1900, 1910, 1920, 1930, and 1934 were respectively, about 25, 203, 370, 615, and 702.

Expenditure on Electrification

Mr. Hutchison on May 15 asked the Minister of Transport what new capital expenditure had been incurred by the London Passenger Transport Board since it took over responsibility for London traffic; and what had been the capital expenditure since that date on underground railway developments and the electrification of suburban railways.

Mr. Hore-Belisha: I am informed that since July 1, 1933, when the London Passenger Transport Board began to operate, it has authorised new expenditure on capital account of about £4,600,000, of which £1,400,000 relates to the board's railways. I also understand that within the same period the Southern and L.M.S. Railway Companies have charged to capital expenditure approximately £280,000 and £110,000 respectively in connection with electrification within the London suburban area.

Underground Railway Lifts

Mr. Summersby asked the Minister of Transport if he was aware that automatically-closing gates and loud speakers were now being employed instead of liftmen at the Strand underground station; and whether in view of the possible danger to the public and also in the interests of employment, he would make representations to the board against the continuance of this practice.

Mr. Hore-Belisha: I am aware that the London Passenger Transport Board is now using new automatic control equipment at some of the lifts at its Strand station. Similar automatic lifts have been in satisfactory operation for about 2½ years at another station on the board's system and I am advised that there is no reason for apprehending danger to the public in connection with such use. I am, however, watching the experiment from this point of view.

(*See editorial note on page* 954)

NOTES AND NEWS

The late Mr. A. W. Barrett.—We regret to record the death, on May 15, of Mr. A. W. Barrett, Assistant Chief Commercial Manager (Claims), L.M.S.R.

L.N.E.R. Assessment.—It is understood that the various local authorities who are affected by the decision of the Railway Assessment Authority that the net annual value of the undertaking as a whole of the London & North Eastern Railway Company in England and Wales was nil, will appeal against the decision.

German Main Line Electric Railway.—On May 10, Dr. Dorpmüller, General Manager of the Reichsbahn, opened to electric traction the 86-mile double-track line between Augsburg to Nuremberg, an extension of the Bavaria-Württemberg electrified system. The cost of conversion amounted to 34,000,000 RM.

San Paulo (Brazilian) Railway.—In future, currency receipts of the railway week by week and in the aggregate will be converted into sterling at the "free market" rate of exchange instead of the "official" rate of exchange as heretofore. Comparisons will be made with the receipts of the previous year converted at the average rate of remittances for that year.

A.S.L.E.F. and Overtime.—At the annual conference of the Associated Society of Locomotive Engineers and Firemen at Hampstead on May 14, the conference instructed the executive committee to go forward with the demand that the overtime of several hours a day now being worked by footplate men should be discontinued, and the eight-hour day which was conceded in 1918 be adhered to.

Film Symposium on Welding.—On May 22 and 29 a display of films accompanied by commentaries is to be given at British Industries House, Engineering Section, Marble Arch, London, W.1, between the hours of 5 and 7 p.m. The films are being shown by the courtesy of the Acetylene & Welding Consulting Bureau Limited, the British Oxygen Co. Ltd., and Murex Welding Processes Limited, and applications for tickets should be addressed to Mr. Guy F. Dowding, A.M.I.Mech.E., Manager, Engineering Section.

Farewell Luncheon to Mr. A. Duruz.—Mr. A. Duruz, who has just retired from the position of Manager of the Swiss Federal Railways Agency and Travel Bureau in London, was entertained to luncheon at the Langham Hotel yesterday by members of the Travel Luncheon Club and their guests. Mr. Gilbert S. Szlumper, who presided, spoke in appreciative terms of the esteem felt for Mr. Duruz by all who had had business associations with him, and made a presentation of a silver tea service. Brief speeches followed by Messrs. R. G. Studd, M. E. Huskisson, and M. Vignon. Mr. Duruz, in replying, referred to the assistance he had received for so many years from the British railway companies and tourist agents.

New Post Office at Paddington Station.—Sir Kingsley Wood, M.P., H.M. Postmaster-General, will open on Wednesday, May 22, a new post office on No. 1 platform, Paddington station, G.W.R. This post office is the first fully equipped Crown post office in a railway station in Britain, and, as such, marks a new era in co-operation between the Post Office and the railway companies.

The Moscow Underground Opened.—On Wednesday, the 15th, M. Stalin formally opened for regular public traffic the first section of the Moscow underground railway. Representatives of the London Passenger Transport Board were present. Despite repeated announcements to the contrary in various newspapers, only trial and demonstration trips had been run previously.

Road Accidents.—The Ministry of Transport return for the week ended May 11 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding week of last year:—

	Killed, including deaths resulting from previous accidents	Injured
England...	... 116 (112)	4,332 (4,056)
Wales ...	... 7 (7)	199 (177)
Scotland...	... 9 (9)	435 (332)
	132 (128)	4,966 (4,565)

The total fatalities for the previous week were 112, as compared with 124 for the corresponding period of last year.

New Underground for New York.—Mr. La Guardia, the Mayor of New York City, has announced the decision of the civic authorities to build a new underground railway at a cost of approximately £10,000,000. The line, which will run underneath Sixth Avenue, will form a link in the Eighth Avenue line, already owned by the City, between Eighth Street and 59th Street on Manhattan Island. Construction will begin in about a month, and is to be completed in three years, after which the existing elevated railway along Sixth Avenue will be demolished.

The L.M.S. Silver Jubilee Locomotive.—We regret that, due to a misunderstanding, two errors crept into the short article on the above subject, appearing on page 930 of last week's issue. The name of the firm by which the chromium plating work on the engine was done was the Chromium Portable Plater Sales Company, 169, Hampstead Road, London, N.W.1, and not as given in the article. It was further stated that the plating material was sprayed on to the surfaces prepared to receive it, whereas in the process of the firm named it is deposited by means of a pad or brush operated either by hand or by electrical means. We hope to publish further details regarding this interesting process in a future issue.

Perfectol Car Cleaner.—Due to a typographical error, the advertisement for this product which appeared on page 21 of last week's issue gave the name of the maker as Henry W. Peabody & Co. of London, and omitted the word "Limited." We regret the omission and have pleasure in recording that the full name and address is Henry W. Peabody & Co. of London Limited, 16, Eastcheap, E.C.3.

Wage Cuts Restoration Proposal.—Proposals for the restoration of the remaining wage cuts of the locomotive, clerical, and traffic grades employed by the four main-line railway companies were discussed at a joint meeting of the executives of the National Union of Railwaymen, the Associated Society of Locomotive Engineers and Firemen, and the Railway Clerks' Association in London on May 9. After considerable discussion, it was agreed that the respective executives should consider the position further. Representations may be made to the railway companies for a meeting to discuss the position.

Opening of the Little Belt Bridge.—The new bridge over the Little Belt constructed by the Danish State Railways to connect Jutland with the island of Funen was opened on Tuesday by the King of Denmark. The bridge is 3,850 ft. in length and replaced a wagon ferry across the strait. It carries a double line of railway, an 18-ft. roadway and a footway. The opening of this bridge synchronises with the introduction of the fast diesel railcar services already referred to in these pages and enables Copenhagen to be reached in 32 hr. from London. The opening took place in the presence of about 700 official guests and 30,000 visitors. In an inaugural speech at the Funen bridgehead, the Minister of Public Works congratulated the Danish and German firms who had built the bridge.

Coal Economy on the "Great Western."—Mr. Charles S. Page, Chief Docks Manager, and Mr. W. J. Thomas, a Deputy Chief Docks Manager and the Marine Manager of the Great Western Railway Company's fleet, demonstrated at Fishguard on Wednesday to a number of superintendents of shipping companies' fleets, the coal burning arrangements that have been adopted on the *Great Western*, which is working between Fishguard and Waterford. Mr. Page explained that the *Great Western*, like some of the company's other ships, was originally intended for oil burning, but at an early stage in the design it was decided to test the possibilities of modern steam raising plant with coal. Consequently, steam is raised in this vessel in two Babcock & Wilcox watertube boilers and fired by Babcock & Wilcox Erith-Roe retort stokers. Graded washed coal is supplied from the Powell Duffryn Colliery

and twelve months' experience has shown that, with full efficiency and convenience, coal had proved 20 per cent. cheaper than oil. Special bunkering arrangements have been adopted at Fishguard in the absence of coal hoists, but Mr. Page emphasised that the ordinary bunkering facilities round our ports are adequate without any apparatus such as is found convenient at Fishguard.

"**Road House.**"—On Saturday last the L.M.S. Railway (London) Amateur Dramatic Society gave a spirited rendering at the Cripplegate Institute of Walter Hackett's well-known play "Road House." Messrs. W. F. Humphreys, the Producer, and W. W. Sharp, the Stage Manager, are to be congratulated on the effective casting and staging, especially in connection with the 1899 scene, which created just the right atmosphere. Lance Donovan, as portrayed by Mr. Don Davis, and the dual rôle of Kittie Hamble and her own mother, Belle Tout, played by Miss Wynne Savill, were the chief characters. They were ably supported by the other members of the cast; in particular, Mr. Reginald Brockwell as the innkeeper, Sam Crookston.

Baghdad Railway Extension.—On page 801 in our issue of November 16 last, we anticipated that the extension of the Aleppo-Nisibin section of this railway would be completed, from Tel-Ziouane to the Syrian-Iraq frontier at Tel Kotchek by the end of 1934. Actually the first passenger train arrived at the new terminus on January 16, and since then the 70-km. new section of line has been sufficiently consolidated under ordinary traffic to permit of the running of the Taurus Express over it for the first time yesterday, May 16, in the southbound direction. The first northbound express will leave Tel Kotchek tomorrow. This extension of the Taurus Express brings its terminal point within 1½ hr. bus journey of Mosul.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 19th Week			Totals to Date		
	1935†	1934	Inc. or Dec.	1935	1934	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,926¼ mls.)						
Passenger-train traffic...	452,000	416,000	+ 36,000	7,720,000	7,484,000	+ 236,000
Merchandise &c. ...	432,000	458,000	− 26,000	8,436,000	8,497,000	− 61,000
Coal and coke ...	184,000	209,000	− 25,000	4,723,000	4,824,000	− 101,000
Goods-train traffic ...	616,000	667,000	− 51,000	13,159,000	13,321,000	− 162,000
Total receipts	1,068,000	1,083,000	− 15,000	20,879,000	20,805,000	+ 74,000
L.N.E.R. (6,336 mls.)						
Passenger-train traffic...	306,000	268,000	+ 38,000	5,071,000	4,894,000	+ 177,000
Merchandise, &c. ...	279,000	314,000	− 35,000	5,805,000	5,970,000	− 165,000
Coal and coke ...	202,000	223,000	− 21,000	4,421,000	4,623,000	− 202,000
Goods-train traffic ...	481,000	537,000	− 56,000	10,226,000	10,593,000	− 367,000
Total receipts	787,000	805,000	− 18,000	15,297,000	15,487,000	− 190,000
G.W.R. (3,749¼ mls.)						
Passenger-train traffic...	188,000	172,000	+ 16,000	3,222,000	3,173,000	+ 49,000
Merchandise, &c. ...	158,000	187,000	− 29,000	3,354,000	3,374,000	− 20,000
Coal and coke ...	92,000	92,000	—	1,941,000	2,011,000	− 70,000
Goods-train traffic ...	250,000	279,000	− 29,000	5,295,000	5,385,000	− 90,000
Total receipts	438,000	451,000	− 13,000	8,517,000	8,558,000	− 41,000
S.R. (2,172 mls.)						
Passenger-train traffic...	306,000	259,000	+ 47,000	4,838,000	4,662,000	+ 176,000
Merchandise, &c. ...	56,500	66,000	− 9,500	1,113,000	1,197,500	− 84,500
Coal and coke ...	23,500	26,000	− 2,500	609,000	659,500	− 50,500
Goods-train traffic ...	80,000	92,000	− 12,000	1,722,000	1,857,000	− 135,000
Total receipts	386,000	351,000	+ 35,000	6,560,000	6,519,000	+ 41,000
Liverpool Overhead ... (6½ mls.)	1,183	1,093	+ 90	21,038	20,407	+ 631
Mersey (4½ mls.) ...	4,138	4,116	+ 22	78,271	79,583	− 1,312
*London Passenger Transport Board ...	658,200	547,400	+ 110,800	24,118,400	23,545,300	+ 573,100
IRELAND						
Belfast & C.D. pass. (80 mls.)	3,112	1,803	+ 1,309	36,367	35,170	+ 1,197
,, ,, goods	443	502	− 59	9,255	10,089	− 834
,, ,, total	3,555	2,305	+ 1,250	45,622	45,259	+ 363
Great Northern pass. (543 mls.)	10,150	8,150	+ 2,000	163,950	147,150	+ 16,800
,, ,, goods	9,650	9,700	− 50	165,150	162,000	+ 3,150
,, ,, total	19,800	17,850	+ 1,950	329,100	309,150	+ 19,950
Great Southern pass. (2,124 mls.)	23,017	19,308	+ 3,709	386,432	374,718	+ 11,714
,, ,, goods	35,821	35,022	+ 799	674,496	618,103	+ 56,393
,, ,, total	58,838	54,330	+ 4,508	1,060,928	992,821	+ 68,107

* 45th week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes

† Silver Jubilee Week, 1935

British and Irish Railways Stocks and Shares

Stocks	Highest 1934	Lowest 1934	Prices May 15, 1935	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	66½	48½	49	−1
5% Con. Prefce. ...	118	109	118½	+½
5% Red. Pref. (1950)	115	107	111½	—
4% Deb.	117	105	114	+ 1
4½% Deb.... ...	119	109	115½	—
4½% Deb.... ...	129½	115¼	125½	—
5% Deb.	135	126¼	136½	—
2½% Deb.... ...	75	64	78	—
5% Rt. Charge ...	134 7/16	123¼	132½	+2
5% Cons. Guar. ...	132¾	121¾	129	+½
L.M.S.R.				
Ord.	30½	19⅛	18½	−1½
4% Prefce. (1923)	64¼	41	51½	−2
4% Prefce. ...	87	69½	81	−1
5% Red. Pref. (1955)	107	92½	101½	—
4% Deb.	114⅛	100½	109	—
5% Red. Deb. (1952)	118 11/16	111¼	115½	+1
4% Guar.	106½	96¾	103	—
L.N.E.R.				
5% Pref. Ord. ...	24¾	13½	12	−1¼
Def. Ord.	11½	6⅞	6	−⅝
4% First Prefce. ...	76	59½	61	−1½
4% Second Prefce.	47	25½	23½	−2
5% Red. Pref. (1955)	94½	80	81⅛	—
4% First Guar. ...	104	92	100½	—
4% Second Guar.	97⅞	86½	93	—
3% Deb.	90	74½	84½	+1
4% Deb.	114	99¼	107	+1
5% Red. Deb. (1947)	117	108	113½	+1
4½% Sinking Fund Red. Deb.	111¼	105¼	111	+½
SOUTHERN				
Pref. Ord.... ...	90	63⅛	86	−1
Def. Ord.	32⅝	19	24	−1
5% Prefce. ...	118 5/16	107½	119½	+1½
5% Red. Pref. (1964)	115¾	107½	115½	+1
5% Guar. Prefce.	132	120¾	128	—
5% Red. Guar. Pref. (1957)	119½	113	117½	—
4% Deb.	116½	103¼	113½	+½
5% Deb.	134	124 13/16	135½	—
4% Red. Deb. 1962–67	113 11/16	105 9/16	112½	+1
BELFAST & C.D.				
Ord.	6	5	5	—
FORTH BRIDGE				
4% Deb.	110	100	109½	—
4% Guar.	110	100	108½	—
G. NORTHERN (IRELAND)				
Ord.	9¾	4 15/16	9	—
G. SOUTHERN (IRELAND)				
Ord.	25	12½	25	—
Prefce.	21½	13 15/16	25	−½
Guar.	48	39	58½	—
Deb.	67	59	73	—
L.P.T.B.				
4½% "A" ...	126	115	124½	+1
5% "A"	135½	124½	135½	+2
4½% "T.F.A." ...	113½	107½	112	—
5% "B"	131¾	118	128½	+1
"C"	97	73	100	—
MERSEY				
Ord.	15¼	7	12	—
4% Perp. Deb. ...	93½	82½	95½	—
3% Perp. Deb. ...	66½	61½	69½	—
3% Perp. Prefce....	54	44½	52½	—

XUM

CONTRACTS AND TENDERS

The Metropolitan-Vickers Electrical Co. Ltd. has received a part contract from the Great Western Railway for Cosmos electric lamps for a period of twelve months ending April 30, 1936.

Howell & Co. Ltd. has received orders for 5,100 Aquacidox steel boiler tubes for the Bengal-Nagpur Railway and approximately 2,100 Aquacidox steel boiler tubes and 150 superheater smoke tubes for the Buenos Ayres Western Railway.

Egyptian Coal Contract

The Maris Fxport & Trading Company has been awarded the contract by the Egyptian State Railways for the supply of 315,000 metric tons of coal. This company submitted the lowest British tender, namely 25s. 2d. per ton c.i.f. and 17s. 11½d. f.o.b. The lowest quotation received, 20s. 4d. c.i.f. and 12s. 1d. f.o.b., was made by the Societe Egypto-Polonaise for 80,000 tons, but it is understood that, after tests had been carried out, it was decided that the Polish coal offered was inferior to the British.

Whitelegg & Rogers Limited has received an order from the Peruvian Corporation for one Ajax air-operated grease compressor and accessories.

The Crown Agents for the Colonies have recently placed the following orders :—

R. H. Symonds Limited : Copper wire.
J. Wilkes, Sons & Mapplebeck Limited : Copper wire.
J. Stone & Co. Ltd. : Locomotive headlight equipment.
J. I. Thornycroft & Co. Ltd. : Marine engine.
Whitehead Iron & Steel Co. Ltd. : Mild steel bars.
P. & W. MacLellan Limited : Mild steel plates and reinforcing steel.
Tangyes Limited : Pumps and spares.
Exors. of J. Mills Limited : Rail anchors.
Telegraph Condenser Co. Ltd. : Static condensers.
Stewarts & Lloyds Limited : Steel pipes.
Brown Bayley's Steel Works Limited and United Steel Co. Ltd. : Steel tyres.
Motherwell Bridge & Engineering Co. Ltd. : Steel bridgework.
E. C. & J. Keay Limited ; Power station steelwork.
Superheater Co. Ltd. : Superheater spares.
Taylor Bros. & Co. Ltd. : Tyres.
Hoyt Metal Co. of Gt. Britain Limited : White metal.

Patent Shaft & Axletree Co. Ltd. has received an order for 62 locomotive straight axles for the Bengal-Nagpur Railway.

The L.N.E.R. announces that an additional magnet crane is to be provided for the Central Reclamation Depot, Engineers Department, Darlington.

The Chinese Government Purchasing Commission has placed the following orders for equipment for the Canton-Hankow Railway to be supplied to the inspection of Messrs. Fox & Mayo :—

Loudon Bros. Ltd. : Heavy-duty wheel lathe for locomotive carriage and wagon wheels.
J. W. Carr & Co. Ltd. : Rack and pinion, car replacing, and lifting and lowering jacks, and engineers' tools.
Samuel Osborn & Co. Ltd. : Stroudley's ramps for re-railing wagons and locomotives.
Stewarts & Lloyds Limited : W.I. water piping.
Whitt & Chambers Limited : Duplex steam test gauge and dead weight testing apparatus.

The Quasi Arc Co. Ltd. has received orders for one portable diesel engine-driven electric welding set for the Entre Rios Railways and one portable single-operator set for the Great Western of Brazil Railway.

Permanent Way and other Material for South Africa

The South African Railways & Harbours Administration has recently placed orders to the values named as follow :—

Chas. Richards & Sons Ltd. : Gauge clips (£836 3s. 9d., ref. B6817/3) ; fishbolts (£129 15s., ref. B6829/3) ; galvanised coachscrews (£52 10s., ref. B6878).
North West Rivet Bolt & Nut Factory Limited : Bolts and nuts (£731 5s., B6817/2) ; fish bolts and nuts (£1,454 5s. 11d., B6716/2).
Columeta Export Co. Ltd. : Steel sleepers (£3,989 8s. 6d. ; B6817/1).
Petits Fils de Fois de Wendel & Cie. : Steel sleepers (£3,989 8s. 6d., B6817/1).
Bayliss Jones & Bayliss Limited : Fishbolts and nuts, (£4,301, 2s. 11d., B6716/2).
Anderston Foundry Co. Ltd. : Points and crossings, £14,271 5s. (ref. B6865) and £3,515 10s. (ref. B6711) ; also orders for points and crossings to reference B6711, placed with Patent Shaft & Axletree Co. Ltd. (£10,007 16s. 3d.) ; Darlington Railway Plant & Foundry Co.Ltd. (£1,690) ; Cargo Fleet Iron Co. Ltd. (£2,455 5s.) ; Lancashire Steel Corporation Limited (£8,296) ; and Dorman, Long & Co. Ltd. (£2,028 5s.).
British Aluminium Co., Ltd. : aluminium sheets (£244 19s., B6895/1).
United Steel Cos. Ltd. (Workington Iron & Steel Branch) : ferro-manganese (£8,400, B6844).

The Birmingham Railway Carriage & Wagon Co. Ltd. has received an order for 1,500 weldless coupling chains for the Central Argentine Railway.

Jessop & Co. Ltd. has received an order from the Indian Stores Department for a total of 620 sheets of Ransome's type D steel sheet piling and five pieces of corner pile at a total price of Rs. 24,262 f.o.r. Karachi.

Guest, Keen, Williams Limited has received orders from the Indian Stores Department for ten sets of crossing rails at a total price of Rs. 22,440 f.o.r. Shalimar.

C. H. Johnson & Son Ltd. has received an order for five electrically-driven portable coal elevators for loading coal on to locomotives for the Buenos Ayres Great Southern Railway.

Taylor Bros. & Co. Ltd. has received orders for 1,000 pairs of wheels and axles and 460 steel carriage tyres for the Bengal-Nagpur Railway.

We recently recorded that the sale in Birmingham and the Midlands of machines, manufactured by William Asquith Limited had been taken over by Drummond (Sales) Limited. Subsequent negotiations have resulted in the area covered by Drummond (Sales) Limited being extended, and this firm now represents Asquith's interest in Cornwall, Devon, Somerset, Dorset, Wiltshire, Berkshire, Hampshire, Buckingham, Surrey, Sussex, Essex, Kent, London, Middlesex, Hertford, Bedford, and Suffolk, as well as the Midland counties already referred to. Mr. Dooley, direct representative of William Asquith, has joined the organisation of Drummond (Sales) Limited, and will be available for consultation, together with other representatives in the new territory mentioned above.

The Vulcan Foundry Limited has received an order for a leading bogie for an XC class locomotive on the B.B. & C.I. Railway. This bogie is to be fitted with Timken roller bearing axleboxes.

Dean, Smith & Grace Limited has received an order for one motor-driven 8½in.-centre sliding, surfacing and screw-cutting lathe for the Buenos Ayres Western Railway.

John Lysaght Limited has received an order from the South Indian Railway, to the inspection of Messrs. Robt. White & Partners, for 55 tons of steel panel sheets for coaching stock.

The Tata Iron & Steel Company has received an order from the Stores Purchase Committee, Government of Mysore, Bangalore, for 27 tons of 60-lb. rails at Rs. 112 per ton

The English Electric Co. Ltd. has received an order from the South Indian Railway, to the inspection of Messrs. Robt. White & Partners, for motor generator sets and voltage regulators for Madras suburban electric stock.

Enquiries for Locomotives

The Agent, Great Indian Peninsula Railway, invites tenders receivable in Bombay by June 19 for two XP type broad gauge locomotives and tenders. Tender forms may be obtained from the Director-General, India Store Department, London, S.E.1.

Tenders are invited by the Bombay, Baroda & Central India Railway, receivable at the White Mansion, 91, Petty France, Westminster, S.W.1, by May 22 for copper firebox plates and steel material.

Soviet Orders Placed in Great Britain

The orders placed in Great Britain by Soviet trading organisations in March of this year amounted to £911,260 as compared with £907,668 in the corresponding month in 1934. The total value of the orders placed in the first quarter of this year amounted to £2,738,950 as compared with £2,226,317 in the corresponding period last year, an increase of 23 per cent. The following table shows the principal engineering orders placed and goods purchased during the respective periods :—

	March, 1935	March, 1934	Jan.–March, 1935	Jan.–March, 1934
	£	£	£	£
Machinery and equipment ..	177,645	119,494	760,629	282,156
Ferrous alloys and steel	83,845	104,239	275,611	269,101
Non-ferrous metals	116,067	298,803	516,799	594,328

The purchases of machinery and equipment have increased by nearly 170 per cent.

The Haslam Foundry & Engineering Co. Ltd., Derby, has been incorporated, and has taken over the refrigeration and foundry undertaking belonging to Haslam & Newton Limited, which firm will now be known as Newton Bros. (Derby) Ltd.

OFFICIAL NOTICES

Great Southern Railways Company.

CONTRACTS, 1935.

THE Directors of the Great Southern Railways Company are prepared to receive Tenders for the supply of the undermentioned Stores for Six and Twelve Months commencing 1ST JULY, 1935 :—

	No. of Form.		No. of Form.
Acetylene, Dissolved	168	Oils, Lubricating ..	159
Acid, Sulphuric ..	3D	Oils, Gas Engine ..	160
Axles for Locos. ..	102	Oils, Linseed ..	162
Axles for Carriages and Wagons ..	103	Oils, Switch and Fuel	165
Beaters and Picks ..	135	Oxygen, Compressed	136A
Bolts and Nuts ..	15	Paints, Mixed ready for use	142A
Brass and Copper Tube, Sheet Wire, &c.	115	Paints, Spraying ..	155A
Cables, Electric ..	129	Pins, Coupling, Rod, Steel	167
Canvas for Wagon Tarpaulins ..	6A	Rodding, Channel Iron Point ..	143
Carbide of Calcium	136	Rubber V. B. Diaphragms	125
Castings, Iron (Signal)	152	Rubber V. B. Sleeves	126
Castings, Steel ..	110	Rubber V. B. Hose Pipes	127
Cotters, Split ..	138	Rubber V. B. Rings and Washers ..	128
Driers, Liquid ..	142B	Springs, Volute ..	107
Drills, High Speed Twist	147	Steel, Spring ..	106
Grease for Wagon Axleboxes ..	158	Steel, Bloom ..	109
Handles, Tool ..	141	Steel Castings ..	110
Iron, Cable Bar ..	151A	Steel Plates, Sheets and Bars	123
Iron, Bar	151B	Steel Plates for Loco. Boilers	116
Lamps, Electric ..	137	Steel, Reeled, Bars	123A
Lead, Sheet, Red and White ..	161	Steel, Mild Bars for Shackle Screws ..	123B
Oil, Mineral Roof Lamp	154	Tin Plates	22
Oil, Colza	156	Tubes, Steel, for Boilers	153
Oils, Paraffin, Gas and Cleaning ..	157	Tyres for Locos ..	104

Forms of Tender can be obtained on PAYMENT of 6d. each from the STORES SUPERINTENDENT, GENERAL STORES DEPARTMENT, G.S. RAILWAYS, INCHICORE, DUBLIN. Application for forms by post must be accompanied by Postal Order. STAMPS CANNOT BE ACCEPTED. All inquiries for information should be directed to the Stores Superintendent.

Patterns may be inspected at the GENERAL STORES DEPARTMENT, INCHICORE, on and after the 15th instant, between the hours of 10.0 a.m. and 4.0 p.m. (except Saturdays).

Tenders must be enclosed in the envelope supplied for the purpose with each Schedule, and must be posted so as to be with the undersigned before 5.0 p.m. on WEDNESDAY, 5TH JUNE, 1935.

The Directors will not consider any Tender unless it is furnished on the Company's Form, and do not bind themselves to accept the lowest or any Tender.

The decision of the Directors will be communicated not later than FRIDAY, 12TH JULY, 1935, to those FIRMS ONLY whose Tenders are accepted.

By Order,
H. S. COE,
Secretary.

Kingsbridge Station, Dublin.
May, 1935.

PATENTS for Inventions, Trade Marks, Advice, Handbook, and consultations free. King's Patent Agency, Ltd. (B. T. King, C.I.M.E., Registered Patent Agent, G.B., U.S., and Canada), 146A, Queen Victoria Street, London, E.C.4. 49 years' references. 'Phone City 6161.

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OFFICIAL ADVERTISEMENTS.

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Thursday. All advertisements should be addressed to :—*The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1.

Railway and Other Reports

Associated Equipment Co. Ltd.—An interim dividend at the rate of 5d. a £1 unit of stock, free of income tax (being equivalent to approximately $2\frac{11}{16}$ per cent., subject to deduction of tax), will be paid on or about June 14.

German State Railway.—The German State Railway Company is to distribute a dividend of 7 per cent. on the preference shares of the series 1-5. An increase of 7 per cent. is shown in the revenue from goods traffic, and of 7·6 per cent. for passenger traffic.

Timken Roller Bearing Company (U.S.A.).—The net profit for 1934 was $3,486,056, against $2,172,850 in the previous year. Current assets at December 31 were $26,131,216, and liabilities $1,673,981, compared with $22,828,788 and $1,572,149 in 1933.

South Indian Railway. — The directors have decided to pay on July 1, 1935, an interim dividend from surplus profits of 1¼ per cent., less income tax (compared with 2 per cent. paid on July 2, 1934), making with the interest guaranteed for the half-year ending June 30, 1935, namely, 1¾ per cent., less income tax, a total distribution for the half-year of 3¼ per cent.

Westinghouse Air Brake Company.—A consolidated net profit of $656,398, after depreciation taxes and other charges, but exclusive of extraordinary credits and charges, was shown on the operations of 1934. The result in 1933 was a net loss of $659,560. The net profit for 1934 is exclusive of $304,550 surplus credits, and an extraordinary charge of $132,906 representing cost of patents purchased, making a net credit of $171,644. A total of $828,042 was therefore shown on earned surplus account.

Central Wagon Company.—It is announced that the whole of this company's £100,000 6½ per cent. first debenture stock will be redeemed on June 29 at a premium of 2½ per cent. Interest for six months to June 30 will be paid by warrant. The transfer books will be finally closed on June 16, and no transfers accepted after June 15.

Southern Pacific Lines.—Net income in 1934 of the Southern Pacific increased by $5,399,156 and left a surplus of $408,225, compared with a net loss of $4,990,931 in 1933. There was, however, a net deficit on the controlled companies of $4,315,829, but the combined net deficit of $3,907,604 was $5,105,769 less than last year. The net operating income of the Southern Pacific Lines increased by 87·74 per cent. to $17,003,657.

Bruce Peebles & Co. Ltd.—The report of the directors for 1934 shows a profit on the year of £5,309, to which is added £484 brought forward, making £5,793. Of this sum, £5,000 has been applied to depreciation account, leaving £793 to be carried forward. No dividend is recommended on either the preference or ordinary shares. The report states that although the works have been fully occupied during most of the year, competition has been keen and prices low.

Forthcoming Meetings

May 24 (*Fri.*)—**Belgian National Railways Company** (Ordinary General), Palais des Académies, rue Ducale 1, Brussels, at 3 p.m.

Forthcoming Events

May 17 (*Fri.*).—Past and Present Crewe Pupils and Premiums, at Trocadero Restaurant, Shaftesbury Avenue, London, W.1. Annual Dinner.

May 18-June 2.—Institute of Transport, in Austria. Annual Congress.

May 25 (*Sat.*).—Permanent-Way Institution (Manchester-Liverpool), in Lecture Room, Central Station, Mersey Railway, Birkenhead, 3 p.m. "Recent Experiments in Permanent-Way Practice," by Mr. W. Hepworth.

May 28-31.—Institution of Mechanical Engineers, at Bath. Summer Meeting.

May 29-31.—National "Safety First" Association, at Park Lane Hotel, London, W.1. Congress.

May 31 (*Fri.*).—Banquet at Savoy Hotel, London, 7.30 for 8 p.m., to celebrate Colonel R. E. B. Crompton's Ninetieth Birthday, The Hon. Sir Arthur Stanley, G.B.E., C.B., M.V.O., in the Chair.

The Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, E.C.4, at 7.30 p.m. "How the Railways Fight the Snow," by Mr. H. A. Vallance.

June 1 (*Sat.*).—Permanent Way Institution (Manchester-Liverpool), at Temperance Inst., Southport, 3 p.m. *Discussion :* "Mining Subsidence and Permanent Way Maintenance."

June 3 (*Mon.*).—Indian State Railways, at Café Monico, Shaftesbury Avenue, London, W.1, 7 for 7.30 p.m. Annual Dinner.

XUM

Railway Share Market

The stock and share markets retained firmness this week in the face of two conflicting influences which developed in connection with home railway values and might have led to sharp movements either way. One was the favourable factor represented by the "Jubilee Week" traffic returns. The unfavourable factor was the reported demand by the railwaymen's representatives for the full restoration of the "wages cuts." The market was divided between these two influences, and this accounted for the uncertain movement shown by prices in the opening days of the week notwithstanding the record number of passengers announced to have been carried by the London Transport Board.,

When the traffic returns were announced on Wednesday, the market virtually remained unchanged. Although satisfaction was professed with the results in the market, it was evident that disappointment would be displayed by the public. Apart from Southern deferred and preferred, which made a slight fractional recovery when the increase of £35,000 in the week's take was announced, there was little response to the returns. The Southern participates in the London Transport Board's suburban passenger pool to the extent of 25·4 per cent. The Board's "C" stock reflected the large movement of passengers in London and the prospect of additional increases in weekly transport receipts over the next few months. The chief changes in the market have been in the prior charge stocks more than in the speculative issues. The demand for gilt-edged securities is outpacing the demand for stock arising from speculative interest in the traffic receipts. Great Western 5 per cent. rent charge, London and North Eastern 4 per cent. and 5 per cent. debenture stocks, and London Transport Board "A" and "B" stocks each advanced in price, whilst in more speculative stocks there was a weakening tendency.

The movement was, in fact, the reverse of what had been anticipated by the Stock Exchange where the low-priced junior stocks were expected to be in strong demand on the Jubilee traffic returns. Interest in foreign railway stocks took a somewhat similar course, the fixed interest-bearing stocks of the first grade moving up in price whilst the ordinary stocks of the Argentine railways tended to fall.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1934-35	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1934	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1934	Prices: Lowest 1934	Prices: May 15, 1935	Yield % (See Note)
				£	£		£	£	£					
South & Central America.	Antofagasta (Chili) & Bolivia	830	12.5.35	11,560	— 1,130	19	235,200	242,890	— 7,690	Ord. Stk.	26 3/4	19	18	Nil
	Argentine North Eastern	753	11.5.35	9,344	+ 2,346	45	332,187	369,090	— 36,903	,,	11	6 7/8	7	Nil
	Argentine Transandine	111	—	—	—	—	—	—	—	A. Deb.	52	45	40	10
	Bolivar	174	Apl., 1935	6,750	+ 350	17	26,300	27,050	— 750	6 p.c. Deb.	10	6 1/2	10	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	13 5/8	10 7/16	13	3 13/16
	Buenos Ayres & Pacific	2,806	11.5.35	100,591	+ 11,036	45	3,539,227	3,855,861	— 316,634	Ord. Stk.	16 3/8	8 1/2	7 1/2	Nil
	Buenos Ayres Central	190	28.4.35	$104,900	+ $11,200	43	$4,716,700	$4,574,000	+ $142,700	Mt. Deb.	23	10	21 1/2	Nil
	Buenos Ayres Gt. Southern	5,085	11.5.35	139,480	+ 8,087	45	6,513,530	7,094,730	— 581,200	Ord. Stk.	35	22	23 1/2	Nil
	Buenos Ayres Western	1,930	11.5.35	49,054	— 3,229	45	2,033,200	2,396 685	— 363,485	,,	27 1/2	18 1/2	18	Nil
	Central Argentine	3,700	11.5.35	140,080	+ 14,601	45	5,431,291	5,902,357	— 471,066	,,	23	13 1/2	15 1/2	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	14	7	7	Nil
	Cent. Uruguay of M. Video	273	11.5.35	11,854	— 3,871	45	618,381	739,713	— 121,332	Ord. Stk.	15 1/2	8	5 1/2	Nil
	Do. Eastern Extn.	311	11.5.35	2,084	— 1,812	45	86,847	153,234	— 66,387	—	—	—	—	—
	Do. Northern Extn.	185	11.5.35	1,694	— 673	45	50,056	85,276	— 35,220	—	—	—	—	—
	Do. Western Extn.	211	11.5.35	574	— 482	45	34,127	70,450	— 36,323	—	—	—	—	—
	Cordoba Central	1,218	11.5.35	29,080	+ 2,940	45	1,261,950	1,473 510	— 211,560	Ord. Inc.	6	3	3	Nil
	Costa Rica	188	Mar., 1935	18,257	— 2,479	39	149,326	178,636	— 29,310	Stk.	30 3/4	23 1/2	32	6 1/4
	Dorada	70	Apl., 1935	10,700	+ 1,100	17	44,100	41,100	+ 3,000	1 Mt. Db.	103	95	104 1/2	5 3/4
	Entre Rios	810	11.5.35	11,306	+ 1,763	45	548,603	547,645	+ 958	Ord. Stk.	21 1/2	12	12 1/2	Nil
	Great Western of Brazil	1,082	11.5.35	6,400	+ 1,700	19	174,400	167,400	+ 7,000	Ord. Sh.	7/8	5/8	1/2	Nil
	International of Cl. Amer.	794	Mar., 1935	$469,057	— $83,653	13	$1,307,612	$1,523,084	— $215,742	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/-	1/-	1/2	Nil
	La Guaira & Caracas	225/4	Apl., 1935	4,960	+ 1,490	17	15,500	14,380	+ 1,120	Stk.	12 3/4	7 5/8	8 1/2	Nil
	Leopoldina	1,918	11.5.35	18,513	+ 372	19	425,831	413,980	+ 11,851	Ord. Stk.	14 5/8	7	5 1/2	Nil
	Mexican	483	7.5.35	$227,600	+ $44,700	18	$4,370,700	$4,195,700	+ $175,000	,,	3 1/4	1 1/2	1 1/2	Nil
	Midland of Uruguay	319	Apl., 1935	6,362	— 1,230	43	97,748	95,108	+ 2,640	,,	1 1/2	1/2	1 1/2	Nil
	Nitrate	401	30.4.35	7,772	+ 4,294	17	49,694	58,815	— 9,121	Ord. Sh.	3 29/32	51/-	2 1/4	Nil
	Paraguay Central	274	4.5.35	9,100	+ 4,000	44	230,880	147,590	+ 83,290	Pr. Li. Stk.	84	67	60 1/2	9 15/16
	Peruvian Corporation	1,059	Apl., 1935	68,305	+ 18,338	43	625,461	556,896	+ 68,565	Pref.	14 1/2	8	8	Nil
	Salvador	100	4.5.35	¢25,500	— ¢950	44	¢935,852	¢943,383	— ¢7,531	Pr. Li. Db.	75	70	65	7 11/16
	San Paulo	153 1/2	5.5.35	36,565	+ 8,909	18	590,637	542,125	+ 48,512	Ord. Stk.	86	67	58	4 5/16
	Taltal	164	Apl., 1935	4,500	+ 2,875	43	31,385	24,072	+ 7,313	Ord. Sh.	2 1/8	1 7/16	1 1/2	6 11/16
	United of Havana	1,365	11.5.35	23,732	+ 4,776	45	1,055,904	873,296	+ 182,608	Ord. Stk.	6	2	3	Nil
	Uruguay Northern	73	Apl., 1935	891	— 70	43	10,726	11,507	— 781	Deb. Stk.	6 1/4	3	4 1/2	Nil
Canada.	Canadian National	23,735	7.5.35	602,003	— 56,183	18	11,078,512	10,820,875	+ 257,636	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	— 4 p.c.	Perp. Dbs.	78 1/4	51 1/2	59 1/2	6 5/8
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104 1/2	97 1/4	101 1/2	3 15/16
	Canadian Pacific	17,211	7.5.35	430,600	— 19,200	18	7,715,600	7,799,200	— 83,600	Ord. Stk.	18 5/16	11 1/16	11	Nil
India.†	Assam Bengal	1,329	10.4.35	32,707	— 10,948	2	32,707	43,655	— 10,948	Ord. Stk.	88 1/2	72	83 1/2	3 9/16
	Barsi Light	202	20.4.35	5,175*	+ 855	3	8,602	8,647	— 45	Ord. Sh.	10 4/2	9 8 5/6	35 1/6	5 3/4
	Bengal & North Western	2,113	30.4.35	76,636	— 2,095	4	221,979	237,890	— 15,911	Ord. Stk.	297 1/2	262	296 1/2	5 5/8
	Bengal Dooars & Extension	161	20.4.35	1,970	— 203	3	6,307	6,269	+ 38	,,	125 1/4	124	124 1/2	5 5/8
	Bengal-Nagpur	3,269	10.4.35	173,700	+ 8,651	2	173,700	165,049	+ 8,651	,,	105 1/2	96	101 1/2	3 15/16
	Bombay, Baroda & Cl. India	3,072	10.5.35	253,050	+ 2,175	5	957,750	952,950	+ 4,800	,,	115	108 1/2	114 1/2	5 1/4
	Madras & South'n Mahratta	3,230	20.4.35	154,875	— 21,356	3	297.225	348,377	— 51,152	,,	131	122 3/4	125 1/2	7 9/16
	Rohilkund & Kumaon	572	30.4.35	15,458	— 1.391	4	49,770	54,205	— 4,435	,,	263	250	290 1/2	5 1/2
	South India	2,526	20.4.35	114,802	— 889	3	224,371	227,299	— 2,928	,,	119	115	117 1/2	6 13/16
Various.	Beira-Umtali	204	Feb., 1935	59,631	+ 12,630	21	305,135	241,467	+ 63,668	—	—	—	—	—
	Bilbao River & Cantabrian	15	Apl., 1935	1,022	— 765	17	7,150	7,749	— 599	—	—	—	—	—
	Egyptian Delta	621	30.4.35	5,070	+ 134	4	16,103	15,611	+ 492	Prf. Sh.	21 3/16	15 1/4	17 5/8	5 5/8
	Great Southern of Spain	104	4.5.35	1,479	— 808	18	34.061	39,376	— 5,315	Inc. Deb.	4	3 1/2	3 1/2	Nil
	Kenya & Uganda	1,625	Mar., 1935	243,384	+ 518	13	702,381	643,494	+ 58,887	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50	33	44 1/2	7 7/8
	Mashonaland	913	Feb., 1935	105,711	+ 23,209	21	569,259	441,733	+ 127,526	1 Mg. Db.	101	91 3/4	102	4 7/8
	Midland of W. Australia	277	Mar., 1935	12,005	— 1.495	39	122,226	122,214	+ 12	Inc. Deb.	100	93	96 1/2	5 5/16
	Nigerian	1,905	31.3.35	26,244	— 7,643	52	1,983,557	1,858,189	+ 135,368	—	—	—	—	—
	Rhodesia	1,538	Feb. 1935	179,770	+ 39,317	21	930,997	754,591	+ 176,406	4 p c. Db.	104 7/8	97 1/2	103 1/2	3 7/8
	South African	13,217	20.4.35	529,319	+ 54,270	3	1,623,653	1,387,514	+ 236,139	—	—	—	—	—
	Victorian	6,172	Jan., 1935	834,638	— 17,346	30	5,586,612	5,388,619	+ 197,993	—	—	—	—	—
	Zafra & Huelva	112	Mar., 1935	11,058	— 362	13	32,962	34.675	— 1,713	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16

* Chaitri Fair 1935. † Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador receipts are in currency

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the sterling weekly receipts at the par rate of exchange as proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rate of exchange and not on the par value

Diesel Railway Traction

More Fast Diesel Schedules

MARKING the beginning of the summer timetables of Continental railways, May 15 invariably sees a number of noteworthy accelerations, but a feature of the last two or three years has been the increasing use of railcars on fast services over both long and short distances. The present year is no exception to the rule. Details of the 80 m.p.h. and numerous 70-79 m.p.h. diesel train schedules in Germany have already been given in the pages of THE RAILWAY GAZETTE and of this Supplement. Reference has been made also to the main line accelerations in Denmark consequent upon the introduction of the triple-car diesel-electric Lyntog, or Lightning Trains. Accelerations of a similar order have been put into force in France. For instance, a new cross-country railcar service has been introduced between Dieppe and Nantes on the Etat, and the overall timing of 313 min. is equivalent to exactly 60 m.p.h. inclusive of seven intermediate stops. A corresponding service is operated to the same timing in the opposite direction, and apparently in both cases the French legal maximum speed of 75 m.p.h. is to be observed. Of the ability of the 250 b.h.p. Renault railcars, at least, to work such a service there need be no doubt; timings of a fast stopping service between Tours and Nantes were given on page 567 of the issue of this Supplement for October 5, 1934, and those for the Paris-Caen route (with the articulated train) in the issue dated November 2. On the Nord, the triple-car trains have been accelerated by 5 min. to cover the 160 miles from Paris to Lille in 160 min. inclusive of stops at Amiens, Arras, and Douai. Fast diesel cars to new designs have just been introduced in Italy, Roumania, and Spain, and in all cases the vehicles have been designed for a maximum speed of at least 75 m.p.h., a distinct advance in countries such as the two last-named, and a pointer as to how diesel traction may improve travel facilities without the necessity for carrying out expensive relaying or civil engineering works.

Hydraulic Transmissions

SIX years ago hydraulic transmissions for diesel locomotives and railcars were almost as dead as the proverbial dodo. The early experiments with the Schumacher, Lentz, and Williams-Janney types had been given up with something approaching disgust, and the only activities were desultory trials on the Buenos Ayres Great Southern Railway with a 600 b.h.p. locomotive, and the preliminary designing of a 400 b.h.p. locomotive on the L.M.S.R. But with the adoption of the turbo principle hydraulic drive was resuscitated—albeit with the vital difference that some form of direct drive on top gear was incorporated. Developed from the work of Dr. Föttinger at the Vulcan works, Stettin, the first harbinger in this country was the hydraulic coupling evolved by Mr. Harold Sinclair, and further investigation resulted in the production of the Voith-Sinclair hydraulic transmission, in which a turbo-converter is used for torque transmission from starting up to about 50 per cent. of the top speed, and then direct drive through a fluid coupling. Simultaneously the Lysholm-Smith transmission (represented in this country by the Leyland and VSG types) was being developed, and the feature of this design is that direct drive is used in the higher speed range without the interposition of a fluid coupling, a friction clutch being used for the change over from hydraulic drive. Although the perfecting of the turbo principle has made possible the use of partial hydraulic transmissions, their successful application to railway work has been due not a little to the improvement in engine flexibility during the present decade, for the efficiency falls so rapidly above about two-thirds full speed that hydraulic drive could not be employed in this range. On the L.M.S.R. Leyland cars we have noted the change over from hydraulic to direct drive at about 35 m.p.h., and as the top speed of two of these three cars is 56 m.p.h. with 2,000 r.p.m. engine speed, the engine must transmit an appreciable amount of torque, and generally work satisfactorily and economically between the limits of 1,250 and 2,000 r.p.m., a feat which was considered very much in the air at the time the old full-power hydraulic transmissions were dying out.

The Nomenclature of Hydraulic Transmissions

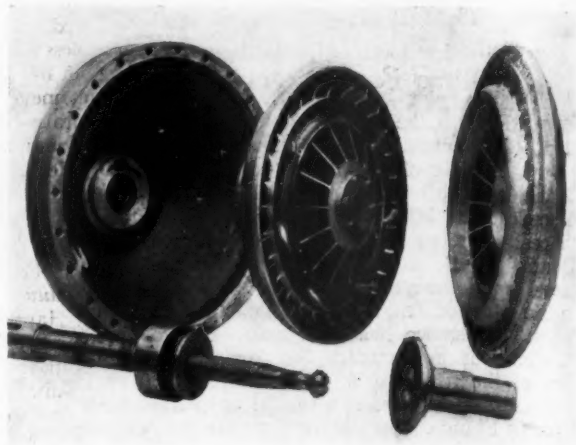
MR. HAROLD SINCLAIR, of the Hydraulic Coupling & Engineering Co. Ltd., in a recent letter to us comments upon the confusion which appears to exist regarding the different types of hydraulic transmission, and which was evident during the discussion on his paper read before the Institution of Mechanical Engineers on April 26. Briefly, the trouble is that there is a tendency in some quarters to consider a vehicle fitted with a hydraulic coupling or fluid flywheel, as having hydraulic transmission. Why this should be so we do not know; it merely shows that there is a lack of knowledge regarding fundamental principles, for the hydraulic coupling (with no torque conversion properties) is akin to a clutch, although Mr. Sinclair does not consider that the term "hydraulic clutch" is descriptive of the characteristics of the fluid coupling. For transmissions of the Voith-Sinclair and Lysholm-Smith type, Mr. Sinclair suggests the use of either "torque converter," "turbo-converter" or "turbo-gear." We are inclined to disagree with him here, for we do not see the necessity of departing from the use of "hydraulic transmission" except to qualify it by one or two words. The hydraulic transmissions developed after the war all had the common feature of incorporating a full-power hydraulic generator and a full-power hydraulic motor; they may therefore be termed "full-power hydraulic transmissions." On the other hand, the present turbo types incorporate direct drive over the higher speed range, and may therefore be styled "partial hydraulic transmissions." It is to be noted that there is no fundamental difference between the Voith-Sinclair, Lysholm-Smith, and Trilok types which would affect the correctness of this appellation. As far as the fluid flywheels and couplings are concerned, we would support Mr. Sinclair and use either of the terms "hydraulic coupling" or "fluid coupling." All this is just a development of what we suggested in the issue of this Supplement for November 3, 1933, when commenting upon a letter from Mr. Sinclair on this subject.

XUM

HYDRAULIC COUPLINGS AND TRANSMISSIONS FOR RAILWAY WORK

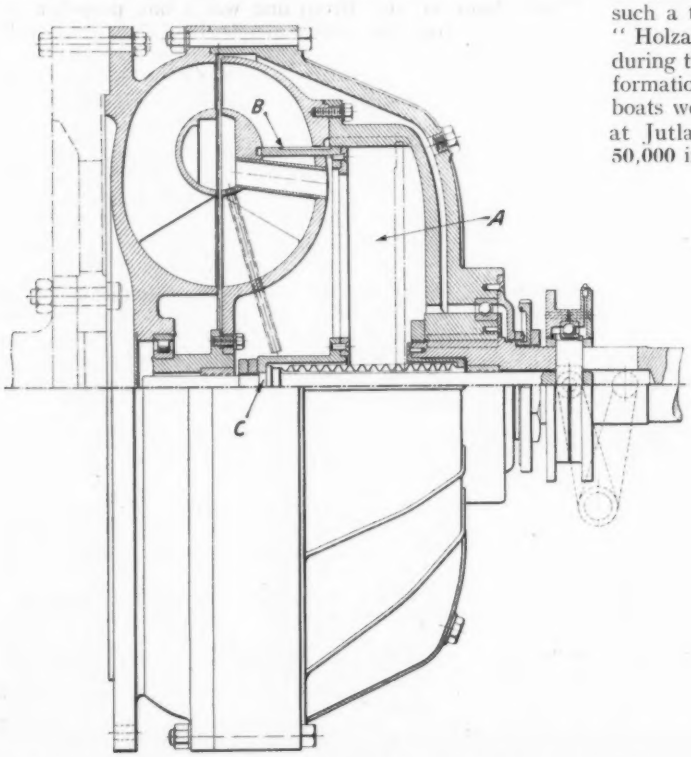
A GOOD deal of attention has been given to the development and design of hydraulic transmissions at recent meetings of the Institution of Mechanical Engineers and also before German engineering societies. On April 26, Mr. Harold Sinclair, of the Hydraulic Coupling & Engineering Co. Ltd., started the wave with a comprehensive account of the various ramifications of the Vulcan-Sinclair hydraulic coupling. A week later Dr. H. F. Haworth (of Leyland Motors Limited) and Mr. A. Lysholm presented a joint paper on the Lysholm-Smith torque converter, and were followed the same evening by Dr.-Ing. Wilhelm Hahn, of the J. M. Voith Maschinenfabrik, who described the Voith turbo transmissions. A pleasing feature of the April 26 meeting was the presence of Dr. Föttinger, to whose pioneer work subsequent inventors have been indebted.

Dr. Föttinger himself recently read in Berlin a paper covering the history of his hydraulic transformer. About 1902 he was led to consider the idea of making slow speed turbines, on principles made use of later in the Melms-Pfenninger pattern, and when doing so had his attention directed to the possibility of making ordinary gears able to transmit large powers. He then considered a form of electrical transmission with dynamo and motor contained in one casing, the primary and secondary being concentric, and from this came the proposal in 1902 to make a hydraulic transmission of similar outward shape. This seemed to offer a means of transmitting large powers and of controlling them in a simple way. Considerable theoretical work on the subject was undertaken, and in 1907 the Vulcan Shipyard entrusted Dr. Föttinger with the construction of a 100 h.p. trial apparatus with a gear ratio of 4·45 to 1. This was finished in the following year and the results obtained came very close to those calculated, based on investigations by four leading mathematicians.

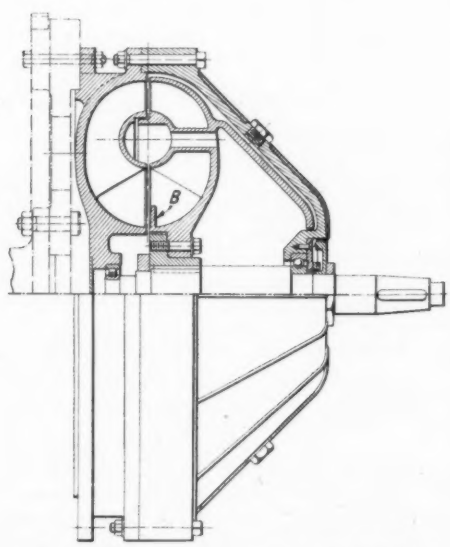


Unassembled Vulcan-Sinclair traction-type fluid coupling

It was then decided to make a gear to transmit 500 h.p. and this was eventually fitted in a steam vessel. In 1910 the idea of the hydraulic turbo-coupling, with a 1 to 1 ratio, was put forward, but it was not until 1924 that such a thing was made, for the British suction-gas vessel "Holzapfel I." Considerable development took place during the war in the German Navy but for some years information about it was not disclosed. In 1914 six torpedo boats were fitted and later the cruiser "Wiesbaden," lost at Jutland. In this case the normal h.p. was 37,000, or 50,000 in an emergency. A requirement was that reversal



Arrangement of Vulcan-Sinclair ring-valve type of traction coupling



Arrangement of Vulcan-Sinclair traction coupling with anti-drag baffle

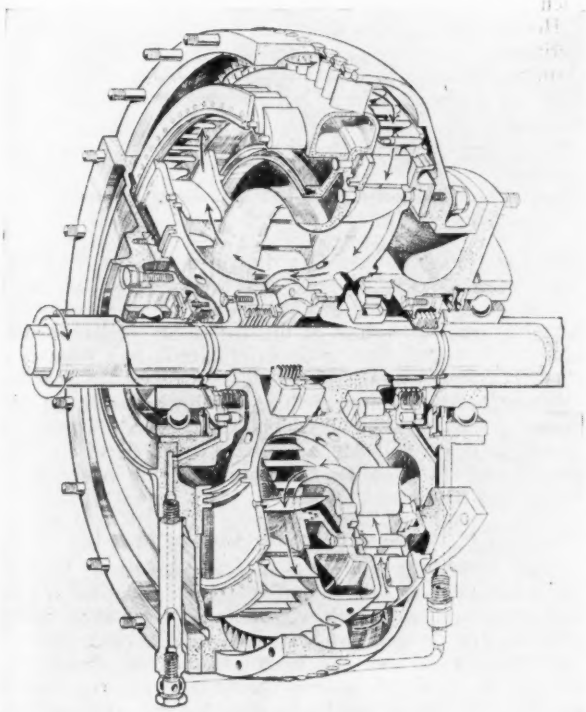
should take place from full ahead to full astern without touching the steam turbine valves, but the action was so quick that the propellers created a hollow in the water and the stern plates of the vessel were strained.

From that time the progress of hydraulic transmissions and gears has been practically continuous. The hydraulic system offers so many advantages, such as noiselessness, high efficiency—especially in recent designs—ease of manipulation, capacity to absorb shock and smooth out uneven efforts, adaptability to many purposes and comparatively modest cost, that there is little doubt that it will continue to find a wide field of application in railway, road and marine work.

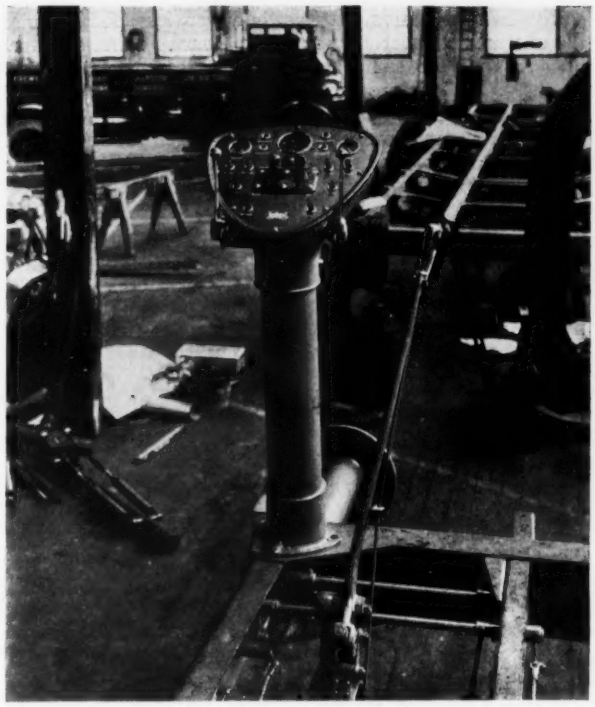
Vulcan-Sinclair Couplings

The characteristics and performance of the various types of Vulcan-Sinclair hydraulic couplings (which have been described frequently in the pages of the *Diesel Railway Traction Supplement*) were presented by Mr. Harold Sinclair, whose paper covered railway, road, and industrial applications. The traction coupling as used in railway work (and especially the ring-valve type) is suitable for i.c.-engined cranes, winches and hoists, and makes the control of the load a far less delicate operation than with an ordinary clutch, and obviates the chance of a stalled engine. The simple traction type of coupling, put between an electric or other motor and the pump used to operate a hydraulic press, permits the motor to go on rotating and maintaining the pressure even when the press is stalled.

Mr. Sinclair described the couplings which were developed for varying the speed of appliances connected to motors of constant or practically constant speed. In these it was possible to extract fluid from the coupling while it was running, so increasing the slip and reducing the speed of the driven unit. The efficiency of the drive



Sectional view of hydraulic portion of Lysholm-Smith torque converter



Control dashboard and pillar for Lysholm-Smith transmission on the L.M.S.R. Leyland railcars

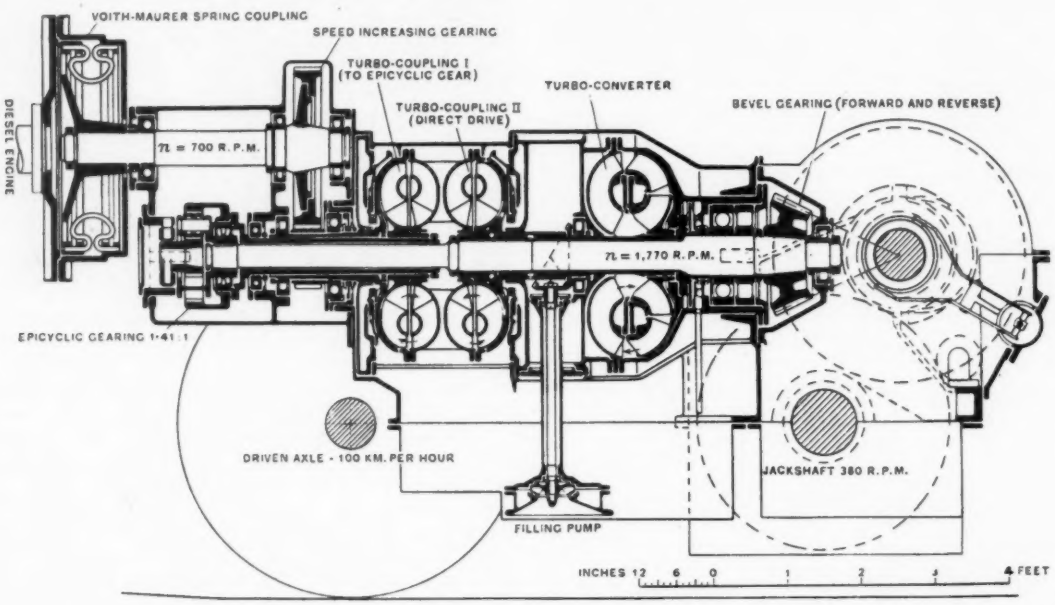
was the latter speed divided by the motor speed, and was thus only 33·3 per cent. for a speed reduction of 3 to 1. Where, however, the driven unit was a fan, propeller, or centrifugal pump, the power required on the output side was but 1/27 of the power taken at full speed, so that the loss was only 66·6 per cent. of 1/9 of the normal power, *i.e.*, less than 7·5 per cent. Hydraulic couplings have been adopted extensively in electric generating and other power stations, for controlling the output of forced and induced draught fans, and for automatically limiting the delivery pressure of centrifugal boiler-feed pumps at fractional outputs. These couplings had made it possible to use the cheap, simple, and robust squirrel-cage motor for driving the auxiliaries at varying speeds. A similar form of coupling had made it possible to use the definitely constant speed synchronous motor as the driving unit in flywheel or load equalising generator sets. The flywheel of such sets prevented the rolling mill or winding motor of 10,000 or 20,000 h.p. from imposing its peak current requirements on the supply mains by yielding up kinetic energy through the generator when the load was excessive. Naturally its speed fell while it was giving up energy and the coupling permitted this fall to take place. A synchronous motor was valuable in any application as, by over excitation, it could be made to take a leading current and so improve the power factor of the factory load considered as a whole.

When the steam turbine was first used for ship propulsion, it was coupled direct to the propeller, and, for this to be run at an efficient speed, the turbine had to be made inconveniently large to obtain a reasonable blade speed. Dr. Föttinger developed a hydro-kinetic speed reducing and torque-multiplying transmission, and this overcame the difficulty. During the discussion on Mr. Sinclair's paper, Dr. Föttinger himself explained that his transmission was only one-fifth the weight of the corresponding

electrical transmission. It was, however, less efficient than the mechanical gearing which Sir Charles Parsons introduced about the same time, and so it was abandoned. Later, when reciprocating engines and turbines were geared together, and when several diesel engines were used to drive the same propeller, Dr. Föttinger brought out a simplified form of his speed transformer, namely, the hydraulic coupling. It was an excellent damper of torsional oscillations, and, had it been used during the war, it might have saved many submarines from loss due to fractured propeller shafts. Its use since the war had been very extensive, and where it was employed the gearing needed in a motor ship could be of the comparatively light pattern used in conjunction with the smooth running steam turbine, and yet comply with all regulations. Dr. Föttinger explained that fluid circulating in a tube or chamber which was itself turning about a remote axis encountered 10, 100 and even 1,000 times the resistance encountered in a stationary tube or chamber. He attributed the phenomenon to super-turbulence and explained that this was responsible for the relatively low efficiency of hydro-kinetic torque converters. He himself was still studying this form of torque converter, and he anticipated being able in the near future to cut down the losses to between one-half and one-fifth of their present values, thus inaugurating an era of successful hydro-kinetic power transmission.

Mr. Sinclair called attention to the fact that not a few engineers confuse the various kinds of hydraulic drive. He suggested that the variable displacement pump type of drive be denoted hydro-static, to distinguish it from couplings and speed transformers of the Föttinger type, which he proposed to call hydro-kinetic. Mr. Hornbuckle, of the L.M.S.R., considered it advisable to describe as hydraulic only those drives depending on variable displacement pumps, and to call any drive of the fluid turbine variety a fluid transmission. Vulcan-Sinclair couplings he proposed to call " fluid transmission, simple type," and speed transformers of the Föttinger and Lysholm-Smith variety he proposed to call " fluid transmission, reaction type." A disadvantage of the ordinary locomotive was that its full power was available at the wheels over only a limited speed range. Speed transformers appeared likely to overcome this limitation. It was pointed out by another speaker that the hydraulic coupling had done much to make internal combustion traction possible on railways, where the cushioning effect of rubber tyres was absent and where in consequence an engine and transmission was liable to be subjected to some very severe shocks.

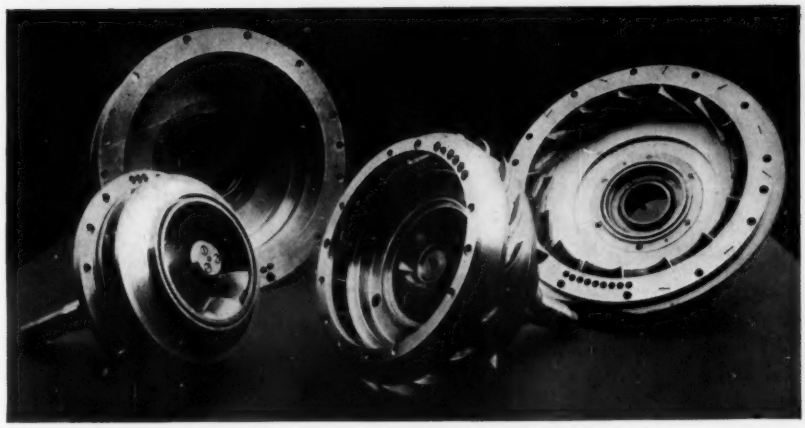
Mr. Alcock pointed out that the anti-drag baffle was developed in the course of trials carried out jointly by the Hydraulic Coupling & Engineering Co. Ltd. and the Hunslet Engine Co. Ltd. One illustration in the paper depicted a constant-mesh gearbox for traction purposes having an auxiliary clutch by means of which the drive could be sustained, even when the gear was being changed. This box obviated coupling snatch and reduced the risk of coupling breakage. It was described in THE RAILWAY GAZETTE for March 25, 1932, and the author of the paper stated that several of the kind were being constructed. Mr. Pomeroy, President of the Institution of Automobile Engineers, stated that some careful tests had been conducted with a Daimler automobile to determine whether the continuous slipping of the fluid flywheel affected fuel consumption. Five hundred miles had been run with the coupling in use and 500 miles with it locked solid. The results had been 34·3 ton-miles per gal. with the coupling in use and 35·3 with it locked.


VOITH-MAURER SPRING COUPLING
SPEED INCREASING GEARING
TURBO-COUPLING I (TO EPICYCLIC GEAR)
TURBO-COUPLING II (DIRECT DRIVE)
TURBO-CONVERTER
BEVEL GEARING (FORWARD AND REVERSE)
DIESEL ENGINE
n = 700 R.P.M.
n = 1,770 R.P.M.
EPICYCLIC GEARING 1·41 : 1
DRIVEN AXLE - 100 KM. PER HOUR
JACKSHAFT 380 R.P.M.
FILLING PUMP
INCHES 12 6 0 1 2 3 4 FEET

General arrangement of Voith duplex hydraulic transmission as being installed in 1,380 *h.p. diesel locomotive*

Lysholm-Smith Converter

The Lysholm-Smith transmission, described by Dr. Haworth and Mr. Lysholm, is a development of the Föttinger system, which incorporates a co-axial pump impeller and turbine through which fluid is circulated. A flat efficiency curve has been obtained principally by means of improved multi-stage turbine blading, which enables the torque-speed range to become automatically variable within a wide range of high efficiency. When running at different torque-speed ratios the blading losses due to the varying inlet angles are the most important, and account for nearly the total loss at the stalling point



Torque-converter elements of Voith-Sinclair hydraulic turbo-converter with two-stage turbine

and at racing speed. This point was gone into at some length by the authors and various efficiency curves and equations presented.

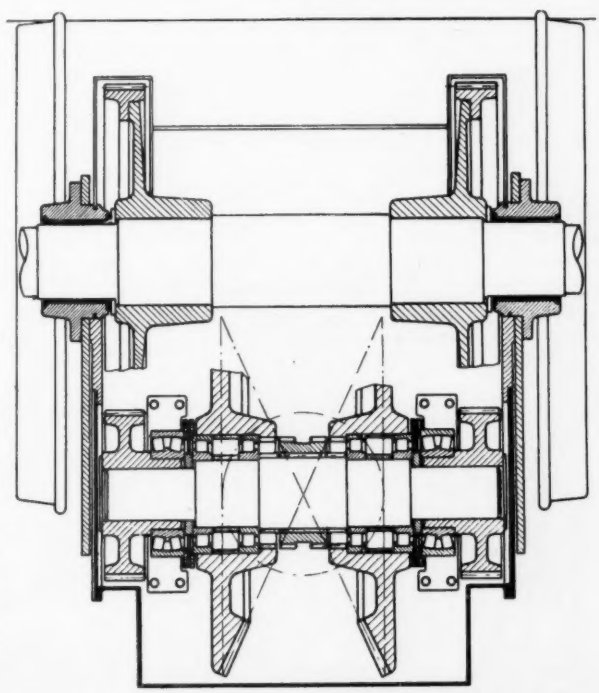
Direct drive over the higher speed range is incorporated, because if the converter was used from standstill to maximum speed the efficiency would be less than that of geared drive. There is no advantage in using the hydraulic drive beyond the point at which the secondary and primary torques are equal; at this point direct drive is engaged and the other end of the torque converter curve is not required. One of the main features of the Lysholm-Smith transmission is thus a two-way friction clutch which can be operated by electro-magnetically controlled air or vacuum cylinders. This clutch is not called upon to start the vehicle, but is used only at the change over from hydraulic to direct drive.

Controlled blades in the pump element are the latest improvement, and it is claimed that this feature will give a starting torque equal to that of electric and mechanical transmissions. The blades are adjusted by an axially-movable splined sleeve. With the blades closed there is practically no secondary torque and at the other end of the scale it is possible to overload the engine when desired; critical speeds may be avoided also. In railway work the adjustable blade Lysholm-Smith converter has been applied to diesel shunting locomotives with a drawbar pull of 6,300 lb., and a unit taking up 400 h.p. at 700 r.p.m. has been tested in America.

Voith and Voith-Sinclair Transmissions

In contradistinction to the Lysholm-Smith transmission the Voith turbo transmission, described in Dr. Hahn's paper, and also dealt with in detail in the issue of this Supplement for May 18, 1934, does not employ a friction clutch, but incorporates a fluid coupling of the Vulcan-Sinclair type in addition to the turbo-converter unit. Dr. Hahn considered that the addition of a fluid coupling to the converter gave a definite improvement in the shape of the torque curve compared with the ideal curve over the higher speed range, and the fluid coupling alone is used from two-thirds full speed to the maximum. Although it was agreed that more favourable efficiency curves could be obtained by fitting the turbo unit with adjustable runner blades and guide vanes, the extra complication and decreased reliability were not justified by the possible gain in efficiency. In the application of torque converters to railcars the zones of low efficiency only predominate at the start and for a relatively short time, and the advantage of reliability would seem to be essentially greater than the relatively small gain in efficiency obtainable by adjustable vanes.

Comparative speed-tractive effort and speed-time curves of vehicles fitted with different forms of transmission were presented by Dr. Hahn, and particulars given of a Voith transmission set destined for a diesel locomotive of 1,380 h.p. with a drawbar pull of 19,000 lb. and a top speed of 60 m.p.h. This transmission is of the Voith duplex type, with two couplings on the coupling side of the converter. These two couplings drive through gears of different ratio on the secondary shaft, and permit of the tractive effort being well maintained as speed rises. The average efficiency is over 80 per cent. for more than 80 per cent. of the secondary speed range, and the efficiency exceeds 90 per cent. over half of that range. The locomotive to which this duplex transmission is being fitted is to be equipped with bevel gear drive to an intermediate shaft for forward and backward running, and the final drive to the wheels is through rods. The transmission arrangement is shown in two of the accompanying illustrations, from which it will be observed that the converter unit is speeded up to reduce its size.

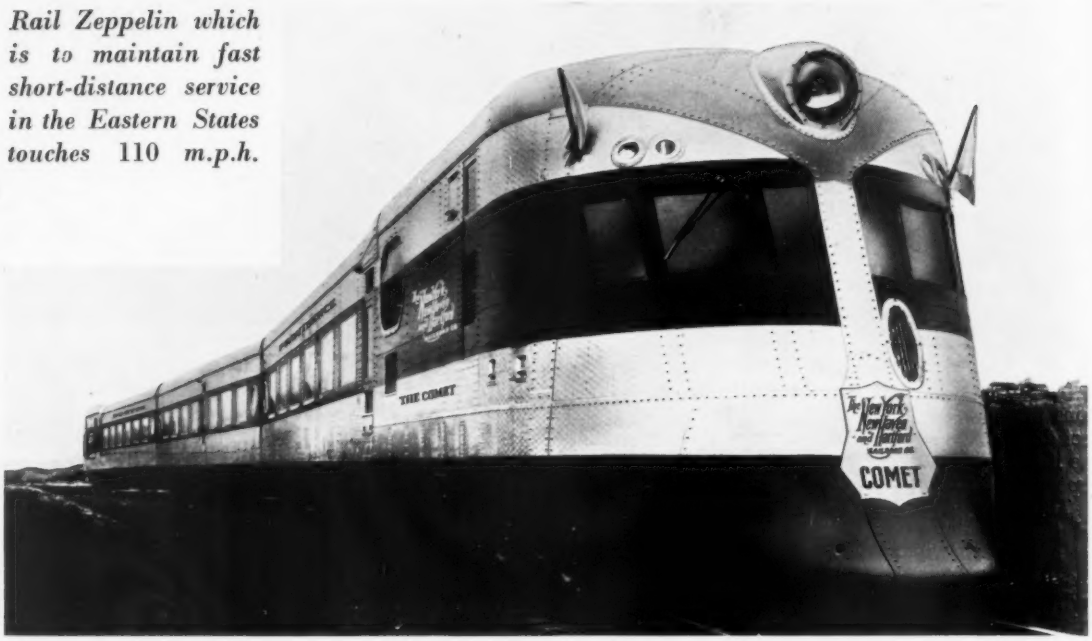


Bevel gear drive of Voith hydraulic drive applied to 1,380 h.p. diesel locomotive

XUM

AMERICA'S LATEST SUPER-SPEED DIESEL TRAIN

Rail Zeppelin which is to maintain fast short-distance service in the Eastern States touches 110 m.p.h.



800 b.h.p. aluminium-alloy diesel-electric train on the New York, New Haven & Hartford Railroad

FOR the operation of a 60 m.p.h. service (including one intermediate stop) over the 43·3 miles between Boston (Mass.) and Providence (R.I.) the New York, New Haven & Hartford Railroad last year ordered from the Goodyear Zeppelin Corporation, of Akron, Ohio, at a cost of $250,000, a triple-car streamlined diesel-electric train of 800 b.h.p. Publicity material at the time the order was placed dubbed this unit the Rail Zeppelin, but on its completion it was named The Comet. The maximum speed attained on a trial run from New Haven to Boston on April 29 is stated to be 110 m.p.h., but in normal service the train will not exceed 90 m.p.h. The tentative schedule which the train will take up in June is five round trips a day between Boston and Providence, commencing at 7.30 a.m. and terminating at 11.0 p.m. Due to the short distance of the run, and the lack of facilities for turning a 207-ft. set, a driving cab has been fitted at each end, and the train thus differs from all the previous American streamlined trains.

A power plant is fitted at both ends, and each consists of a high-speed light-weight Westinghouse engine of 400 b.h.p. direct coupled to a d.c. main generator with an overhung exciter. Two 200 h.p. nose-suspended traction motors are located on each end truck, and are of sufficient power to accelerate the train to 60 m.p.h. in less than two minutes. Normally the two power-transmission sets are used simultaneously, but the train can be operated from either end with only one set working. The seating capacity of the train is 160, and the weight 126 tons.

General Design

Maximum strength with weight was the key-note of the design, and a special type of car body was created to accomplish this requirement. This design offers exceptional rigidity and also a high factor of safety and energy absorbing qualities in a collision. The floor of the car is only 32 in. above top of the rail and two steps are required to enter or leave the train. These steps on both sides of central vestibules are air-operated, and in the closed position steps and doors retain a smooth outside surface. This smooth outside with well rounded corners, in the covered bottom of which the trucks are located, and the good aerodynamical shape of the ends, reduces the air-resistance of the train to a minimum. Due to the low floor height it was not necessary to reduce the cross-section of the passenger compartments in order to minimise air-resistance and therefore a clear standing height of 7 ft. 10 in. in the centre and 6 ft. 8 in. doors could be provided. The width of 9 ft. 4 in. is also larger than normal and leaves a 26-in. aisle with two 43-in. double seats on both sides. The centre of gravity of the train is about 54 in. above the rail. A new type of truck suspension has been designed to take care of this low centre of gravity and to provide easy riding at higher speeds. Elliptic springs have been eliminated and coil springs with hydraulic damping provide the cushioning. Roll of the car body has been almost eliminated, and all oscillations are of low frequency and well damped.

All passenger compartments are indirectly lighted and a thermostatically controlled air-conditioning system provides ventilation and heating or cooling as required by weather conditions. The interior design is characterised by simplicity and the colour scheme has been chosen to create comfort and warmth as well as cheerfulness. A limited number of tan colours, ranging from a light ivory tone of the ceiling to a deep rich copper colour of the seat covers, combined with metal mouldings and other hardware of natural silver satin finish has been selected. An efficient air brake system with deceleration control stops the train from its highest speed in a very short distance. The train cannot start before the air reservoir pressure is up to normal, and dead-man handle control is fitted. The train cannot start while the doors are open and the steps cannot be closed while somebody is touching them. An airbrake

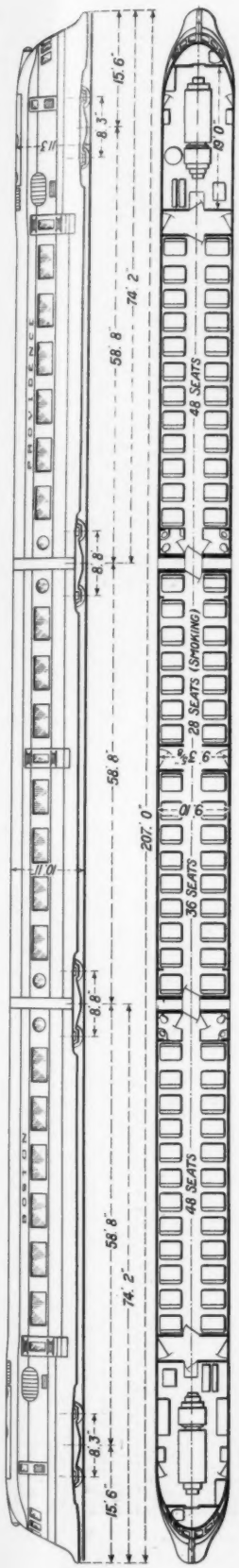


Diagram of the new 800-b.h.p. diesel-electric train on the New York, New Haven & Hartford Railroad

application automatically idles the engines and if the lubrication system does not function properly the engine will trip itself.

Car Body Design

The Comet is built as a tube with flat sides and well arched roof and bottom. In place of the centre sill and other longitudinal framing of the conventional train, four longitudinal tubular members run the entire length of each car at the four corners of the cross-section. They are held in place by the roof carlines, side posts and floor to form a structure which has a high bending and impact strength. These longitudinal members are connected at the end of each car by bulkheads, rigidly cross-braced to transmit the stresses to the articulated connections.

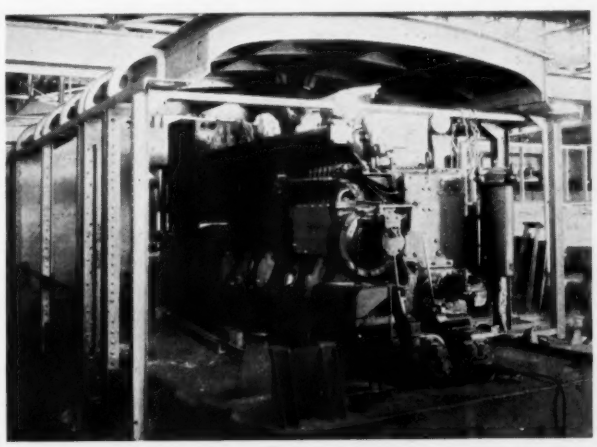
This tubular construction places most of the material in the outer shell, and since by locating the strength members at the greatest possible distance from the centre of gravity of the cross-section the maximum moment of inertia is obtained, the deflection in the fully loaded cars is less than one-sixteenth of an inch. The torsional rigidity is so high that the car can be supported under one side bearing with only one-sixteenth of an inch torsional deflection on the opposite side.

With weight reduction and safety paramount factors in the design, aluminium was selected as the main structural material. In its strong alloys, it has approximately the same strength as structural steel but weighs only one-third as much. This permitted the use of larger sections which, so far as the strength-weight ratio is concerned, could not be duplicated in the steels commonly used in car construction. The aluminium sections are assembled by means of aluminium rivets driven cold. The rivet alloy was selected after a series of tests at the Goodyear-Zeppelin plant in Akron and combines ease of driving with excellent corrosion resistance. The Comet is the first train which has been built with aluminium rivets throughout.

The four longitudinal tubular members are tied into heavy welded steel end sills through the end bulkheads. The centre vestibules are formed by two strong diagonally-braced bulkheads. Diagonal members at the corners of the end bulkheads provide lateral rigidity and help to carry the stresses of shock up into the circumference of the tubular car body. Since the shear is least at the centre of the car, the shear deflection is reduced appreciably by placing the door at this point. The roof structure is formed by connecting the two upper longitudinal tubular members with pressed sheet carlines. It is braced longitudinally by six intermediate purlines. The sheathing is formed from heavy gauge sheet.

The two end cars have the same type of construction as the centre car except for the ends in which the power plants are located. In the engine room, the underframe is composed of a welded steel bedplate, which rests on the longitudinal tubular members that have been reinforced in this area to take care of the greater weight. The bedplate is 20 ft. long and 11 in. deep and serves as the lower half of the crankcase of the diesel engine. It is formed by a top and bottom plate reinforced with longitudinal and transverse bulkheads which also provide a series of compartments for the storage of fuel, lubricating oil and water. All brackets required for the structural connections, the main bulkhead at the body bolster and the connection to the rounded front end of the car are welded to the bedplate. To facilitate the removal of the engine from the car, the section of the roof immediately above the bedplate is removable.

Each end of the train forward of the power plant involves a design which contributes to extreme rigidity. The two lower longitudinal tubular members are formed into an arch at the end of the car and riveted into a welded steel structure. The lower portion of this welded steel member forms the pilot, while the rear portion is connected to the floor structure and to a heavy shear plate. The entire framework is covered with formed heavy gauge plate, as is the bottom of the underframe. This results in a complete shell reinforced by the framework, window posts and bulkheads. Timken tapered roller bearing axle-boxes are used for all axles.

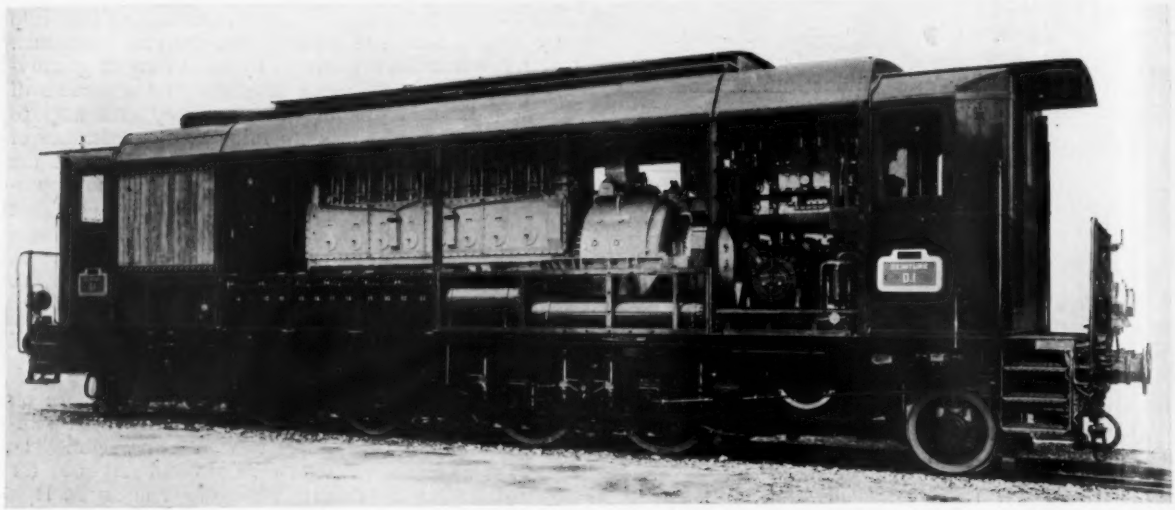


400-b.h.p. Westinghouse engine-generator set

XUM

THE DESIGN AND OPERATION OF A HEAVY DIESEL LOCOMOTIVE

Experience over two years in France



800 b.h.p. diesel-electric locomotive of the C. de fer de Ceinture de Paris

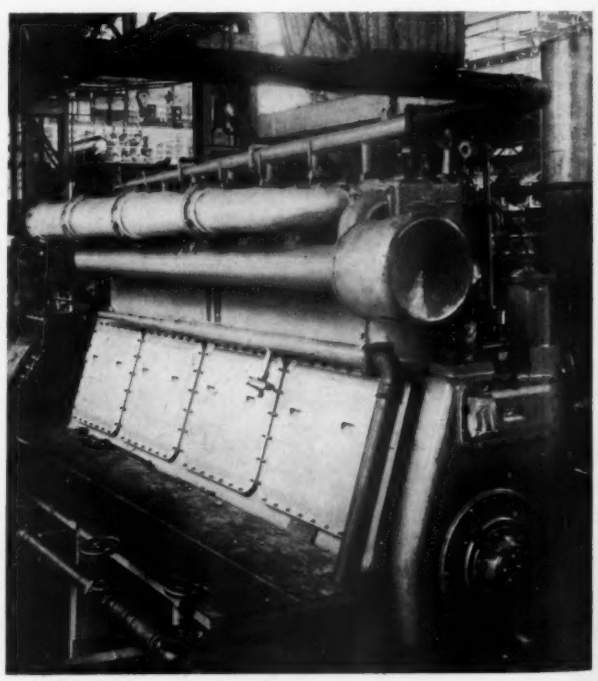
IN February, 1933, the C. de fer de Ceinture placed in service on the Petite-Ceinture lines an 800 b.h.p. diesel-electric locomotive powered by a Sulzer engine, and a photograph and brief description of this unit were given in the issue of this Supplement for June 16 of that year. The locomotive was designed for shunting service and to haul 600-ton freight trains over 1 in 66 grades. Approximately 70 per cent. of the movements are made in shunting service and 30 per cent. in train haulage. One of the conditions of acceptance was the ability to work for 22 hr. a day. Smokeless operation was an important point affecting the choice of diesel traction, for even at the time the order was placed there was much talk of covering over an appreciable part of the Petite-Ceinture tracks.

The locomotive was constructed by the Cie Electrique-Mécanique as main contractor and the transmission equipment is of the Brown Boveri type with an hourly rating of 9 tonnes (20,000 lb.) tractive effort at 10 m.p.h. and a continuous rating of 6·5 tonnes (14,300 lb.) at 14 m.p.h. The wheel arrangement is of the 1-Do-1 type and the rigid wheelbase is 5·3 m. (17 ft. 4½ in.); the total wheelbase is 11 m. (36 ft. 1 in.) and the length over buffers 14·3 m. (47 ft.). The two centre driving axles have a side play of 25 mm. and this, in conjunction with the action of the pony trucks at each end, enables the locomotive to pass round curves of 80 m. (262 ft.) radius. The locomotive in full working order scales 88·5 tonnes (87 tons) made up as follows:—

Mechanical portion	45·5 tonnes
Diesel engine and auxiliaries	13·0 ,,
Electrical equipment	25·0 ,,
Fuel, oil, water, sand, &c.	5·0 ,,

Of the total, 66·5 tonnes (65·4 tons) rank as adhesion, and corresponding to the maximum tractive effort of 18·6 tonnes (41,000 lb.), give a factor of adhesion of 3·6. The maximum designed speed is 60 km.p.h. (37 m.p.h.).

The engine is of Sulzer's four-stroke 8LD28 type, a direct injection development of the older pre-combustion chamber designs fitted to the locomotives of the Buenos Ayres Great Southern, South Manchuria and Siamese State Railways. The eight cylinders have a bore of 280 mm. (11 in.) and a stroke of 380 mm. (15 in.), and develop a continuous output of 800 b.h.p. at 700 r.p.m. The control permits of the engine running continuously at speeds of 700, 510, and 320 r.p.m., but only the two first-named are used in actual operation, the lowest speed being reserved for use when re-charging the batteries. A cross-section of the engine is shown in one of the accom-



800 b.h.p. engine on test at Winterthur

panying illustrations. The engine comprises two groups of four cylinders mounted on a single-piece crankcase, which is of unusual design, and takes up the explosion stresses by means of a patented arrangement of transverse bearers secured to the bolt passing through the main bearing caps, and lipped into the crankcase to remove shear stress from the horizontal securing bolts.

The cylinder liners are let in from the top and extend down to the top transverse member of the crankcase. The pistons are of forged aluminium alloy and carry six pressure and four scraper rings; through hollow-bored gudgeon pins they are fixed to H-section nickel-chrome steel connecting rods which are drilled longitudinally to provide a lubrication passage. The small-end bearings are of bronze, and the big end bearings have white metal linings on a bronze shell. Nine bearings support the eight-throw crankshaft, and the centre journal is mounted in its bearing without any play. The cylinder head contains one inlet and one exhaust valve controlled by the usual push-rods and rockers from a camshaft located in the upper portion of the crankcase. This camshaft also controls the operation of the fuel pump, which, contrary to previous Sulzer practice, is of the Bosch type with eight rams. Pressure lubrication of the engine is ensured by gear driven pumps and the cooler is directly in the oil circuit. The engine circulating water is cooled in radiators mounted on the side of the locomotive, through which air is drawn by the usual Sulzer arrangement of an electrically-driven fan in the roof. Thermostatic control is applied to the lubricating oil and cooling water.

Fuel consumptions over the normal power range on the test bed were as follow:

700	r.p.m.	..	800	b.h.p.	..	170 gr. per b.h.p.-hr.	(0·375 lb.).
700	,,	..	600	,,	..	170 ,, ,,	(0·375 lb.).
510	,,	..	550	,,	..	162 ,, ,,	(0·357 lb.).
510	,,	..	300	,,	..	178 ,, ,,	(0·393 lb.).

The specific consumption when developing 550 b.h.p. at 510 r.p.m. is a remarkable figure, and with fuel of 18,000 B.T.U. calorific value corresponds to a brake thermal efficiency of over 39 per cent. At 700 r.p.m. the lubricating oil consumption is slightly less than 2 gr. (0·0044 lb.) per b.h.p. hr.

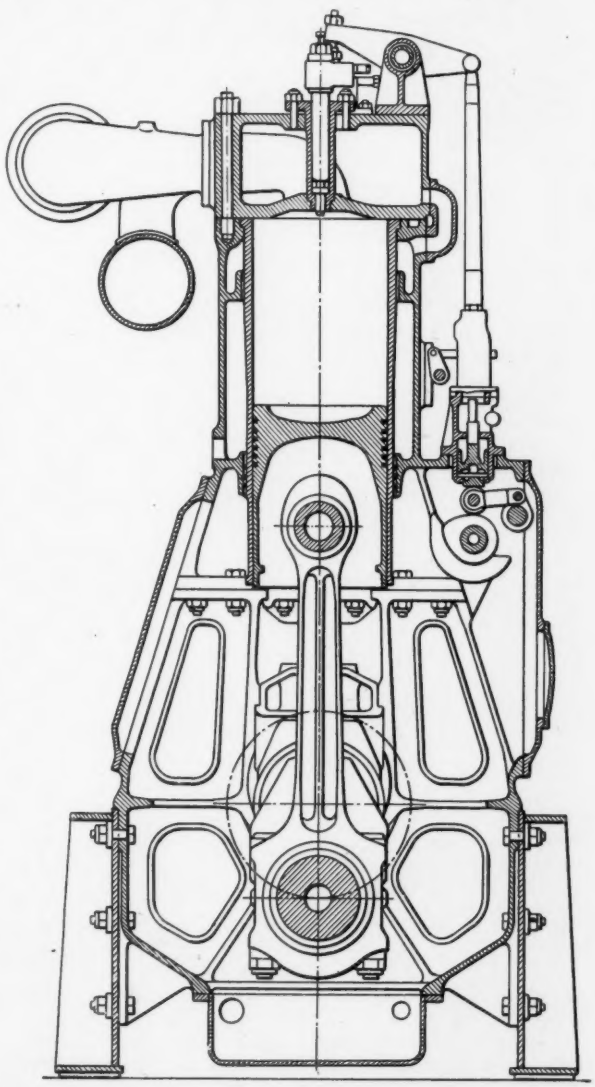
Engine and main generator are mounted on a common underbed of electrically-welded steel which is fixed directly to the main locomotive frame plates and transverse stays. The main generator has an hourly capacity of 475 kW. (1,360 amp. 350 volts) at 700 r.p.m., but at starting the current rises to a peak of 2,200 amp. at 40 volts. The maximum voltage of 750 is used at speeds of 55-60 km.p.h. (34-37 m.p.h.). The auxiliary generator is coupled directly to the main generator shaft and has a capacity of 72 kW. at a voltage of 150, which is maintained constant at both 510 and 700 r.p.m. The four series traction motors are of the nose-suspended type and have an individual hourly rating at 10 m.p.h. of 101 kW. (340 amp. 335 volts).

Service Results

During February, 1933, the locomotive was engaged in trial service, and in making trips for the instruction of engine crews. Beginning in March, a triple crew operated a 24 hr. service with a half-day stop each week for overhaul and running repairs. The handling of the locomotive has proved very easy, and the actual running has been almost without reproach. According to M. Nicolin,* the Ingénieur en Chef du Matériel et de la Traction of the Ceinture, the results set out below have been obtained with this locomotive, which is numbered D1 in the railway company's list.

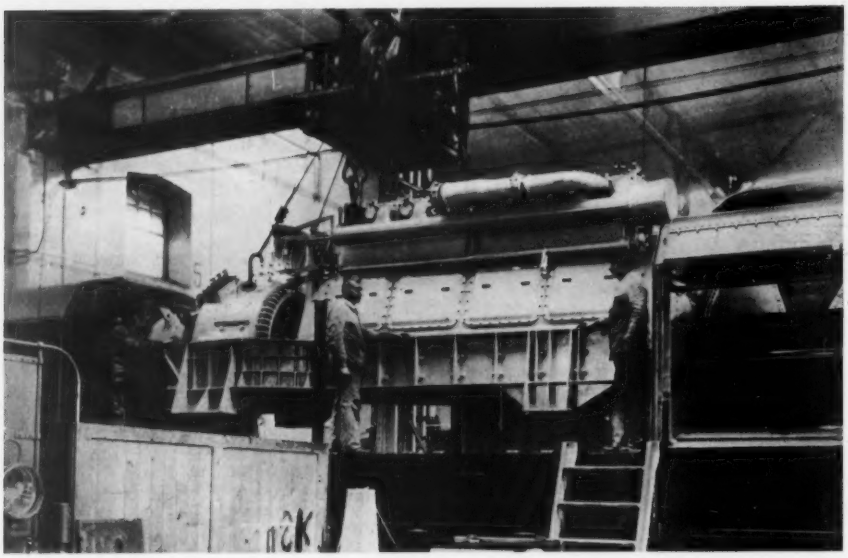
On February 19, 1934, about a year after it first went into service, the fracture of a pipe in the oil circuit of the diesel engine involved the overheating of a crankshaft bearing. To avoid such occurrences in future, the oil distribution pipe system was modified, and as the vehicle had by then completed 70,500 km. (44,000 miles), it was decided to overhaul the locomotive and the diesel engine. During this overhaul it was found that, with the exception of the overheated bearing, the engine was in perfect condition as regards cylinders, crankshaft bearings, crankcase and chassis, a remarkable result after a working period of 3,000 hr., excluding the test periods.

There were no important repairs to be effected. Nevertheless, corrosion to a depth of 5 or 6 mm. was discovered on the outside surfaces of the cylinder casting at a point where the flow of cooling water is choked to obtain its projection as far as the upper parts of the water jackets and cylinder heads, thus assuring its coolness. As this corrosion was caused by undue cavitation, the water spray section was increased to cause a slight diminution of the



Cross-section of 800 b.h.p. Sulzer engine

* In an article in the *Revue Générale des Chemins de fer.*



Diesel engine and attached main and auxiliary generators being mounted on the 800 b.h.p. 1-Do-1 Ceinture locomotive

speed of flow, and thus avoid the cavitation. An inspection of a few months hence will prove whether this modification has been sufficient.

The repairs to the mechanical portion covered only the trueing-up of the wheel tyres, the profiles of which, after 70,000 km. running over frequent curves, were down to the limit. A general clean up was given to the mechanical and electrical portions, and in the course of the inspection it was found that small parts of the traction motor pinion teeth had broken away. This was thought to be due to the fact of a pinion being mounted at one end of the armature shaft only, and to the impossibility of maintaining absolute parallelism between the gear wheels mounted on the wheel centre and the axis of the armature shaft. This trouble has been rectified, and since the locomotive went back into service its performance has been such that the first complete overhaul is not expected to be necessary until another 70,000 km. have been covered.

Organisation of Repairs

Maintenance and periodic visits to the shops are organised in the following fashion. Every fortnight (*i.e.*, after about 3,000 km. (1,860 miles) or 150 hr. of running of the diesel engine) an inspection and adjustment of the valves of two cylinders is made (each cylinder is thus inspected every eight weeks); inspection of four fuel injectors (each injector thus being seen every four weeks). Every four weeks, inspection of the accumulator batteries; every ten weeks, brief inspection of the engine, electrical equipment, oil filters and fuel filters; every six months, overhaul of the compressors and renewal of lubricating oil of the diesel engine. Care has been taken that this renewing shall coincide with the change over from summer to winter oil.* Every year, removal and general overhaul of the diesel engine.

Working Costs

Taking into account the variety of service assured by the locomotive, and as it is impossible at present to differentiate between train-km. and shunting-km., a return has been drawn up in which one hour of shunting is equal to six train-km., which should come very near to the truth. Under these conditions, the following table has been compiled, and gives comparative figures per km. for locomotive No. D1 and for a locomotive of Series 4000 (4-8-0 superheated compound tender engine) effecting the same service on Ceinture lines.

Operating Cost of Ceinture Steam and Diesel Locomotives, Fr. Per Km.

	D1	4,000
Driving crew	3·20	3·20
Fuel	0·77	1·55
Lubrication	0·11	0·04
Water, lighting and miscellaneous supplies	0·01	0·14
Maintenance expenses—materials and workmanship	0·22	0·45
Overhaul (materials and workmanship)†	0·33	0·64
Financial expenses††	2·33	0·65
Total	6·64	6·67

† Locomotives of class 4000 run 45,000 km. between overhauls. Locomotive D1 runs 70,000 km. between overhauls.

†† These charges were established on the basis of the purchasing price of the diesel locomotive under review (2 million fr.) and the price of the steam engine at the same time (650,000 fr.).

These figures demand some explanation. The expenditures regarding driving staff are actually identical for the two modes of traction, but it would be possible to reduce them considerably by using one man only to drive the diesel locomotive. The installation of a dead-man handle would present no difficulty.

The price of oil on which these figures are based is not subject to the taxes levied by the law of February 28, 1934. General expenses have not been taken into consideration, but probably these also could be reduced in the case of the diesel. Heavy repair figures are also not included; these, known for the steam locomotive, unknown for the diesel, are probably about equal. As regards financial charges, which are very high on the diesel, it should be remarked that this locomotive is to a certain degree a prototype, and that the construction of a series would tend to reduce these charges, probably by a fourth, by reason of lower first costs.

It may be concluded that from the strictly economical viewpoint the two forms of traction, steam and diesel-electric, were practically equal at the period of the trials as regards their working conditions on the C. de f. de

* The emptied oil is cleansed and reused in other ways, such as for axlebox oil.

Petite-Ceinture,* but supposing the same service were maintained by diesel locomotives, built as a series and driven by one man, an economy of about 20 per cent. over steam traction might be estimated. The elimination of smoke and simpler driving operation are the final advantages of diesel traction.

In addition to the information given in M. Nicolin's article, Sulzer Bros. Ltd. informs us that after completing 10,000 hr. of locomotive service, inspection proved that the pistons showed no signs of wear, that the piston rings were in good condition and no rings needed replacing; the wrist pin and main bearings were excellent.

* As already remarked, steam locomotives already maintain a triple-crew service on the Petite-Ceinture, reducing to the minimum the stoppage of the machines when fired, and also loss of time and fuel during preparation, fueling, &c. The conclusions reached after one year's service of the diesel-electric locomotive are therefore invalid for traction problems so different.

NEW RENAULT EXPRESS RAILCARS IN FRANCE

Some new Renault diesel-mechanical railcars of 265 b.h.p. are being introduced on fast services on the French State and P.L.M. Railways. The engine and transmission are the same as those of the numerous cars of the same make which have been set to work during the last two years, but the body has been semi-streamlined at each end and a different type of seating provided

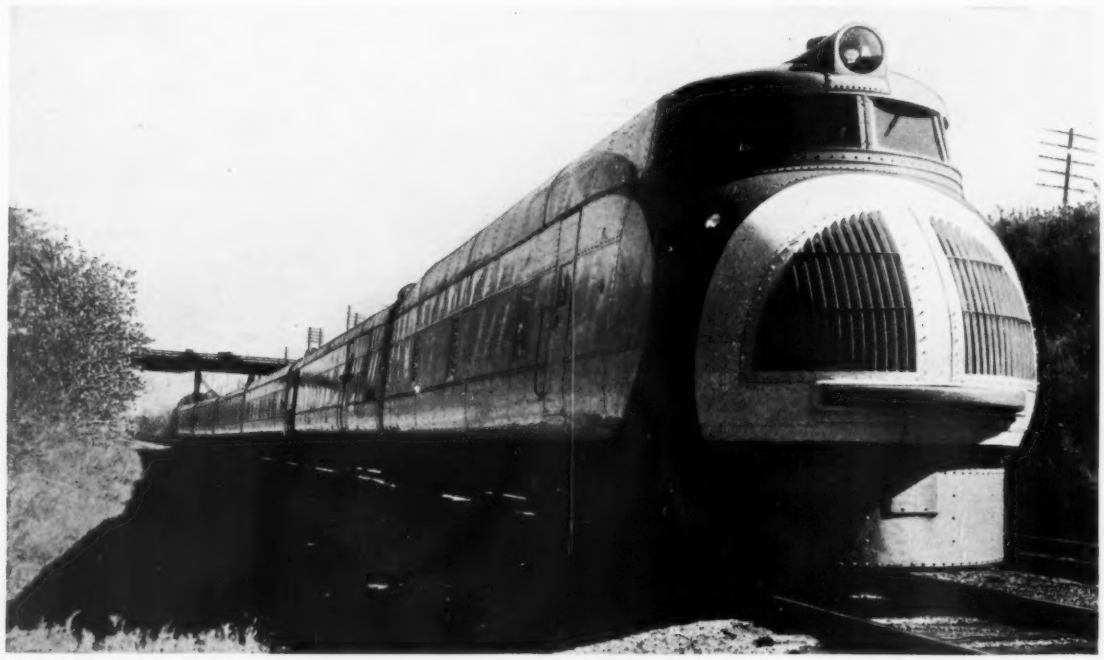
SOME THOUGHTS ON STREAMLINED TRAINS

DURING the course of a paper which he presented before the Railway Club of Pittsburgh on January 24 last, Mr. A. H. Fetters, General Mechanical Engineer of the Union Pacific Railroad, remarked that the application of streamlining to fast moving vehicles is vitally important where the supply of power is limited, as is the case in oil-electric operation. The problem of reducing air drag by careful streamlining was extensively tackled when the U.P.R.R. was evolving the exterior shapes of its high-speed trains during wind tunnel tests. Under the eyes of a competent staff, preliminary scale models of the inaugural train were tested in the wind tunnel of the University of Michigan, and much of the work was carried out at air speeds of from 80 to 90 m.p.h., so that the data would correspond to actual running speeds. As the tests progressed some preliminary results went overboard, for assumptions applicable to aerial models needed revision in regard to ratio of length to cross section, the element of ground drag, and other elements relative to the train model, all of which were found to differ slightly from aeronautical practice.

The work comprised a series of approximations, representing several months of intensive research. When all practical refinements had been made to the model, final measurements of the drag in the wind tunnel showed that when the train travelled at 90 m.p.h. its total wind drag would be approximately 970 lb. Therefore the wind factor alone would require 233 rail h.p. or 290 b.h.p. The frictional resistances set up by journals, flanges, rolling, &c., were estimated on the best known formulæ at about 900 lb. at 90 m.p.h. This gave a total calculated resistance of approximately 1,870 lb. at 90 m.p.h., calling for 450 rail h.p. and 560 b.h.p. These figures have subsequently been closely verified during a series of road tests, where electrical output readings were recorded over a period of several days, together with air brake stopping tests. As the maximum engine output is 660 b.h.p., 600 h.p. of which is available at the generator, the balancing speed is round about 91 m.p.h., just in excess of the specified balancing speed of 90 m.p.h.

Air Brake Problems

To stop from speeds of 90 to 100 m.p.h. within standard distances necessitated an entirely new system of braking, to cope with the problem of arresting 54,000,000 ft.-lb. of energy on the three-car train, or 120,000,000 ft.-lb. of energy on the six-car train, doing 90 m.p.h., in the space of 40 seconds (equivalent to about half a mile). The New York Air Brake Company has successfully conquered this difficulty, although the action of air brakes at such high speeds had not been explored and was largely speculative. Hitherto uniform braking has not been possible because the coefficient of friction between brake shoe and wheel varies widely with speed and unit pressure, and diminishes rapidly at higher speeds, where it is most needed. Although the coefficient may reach 25 per cent. at very low speeds, it decreases to perhaps 5 or 6 per cent. at 100 m.p.h. Such high percentages of braking power are safe at the higher speeds, but become a source of danger when speed falls, and the coefficient of friction between shoe and wheel increases. At a certain point the wheels would lock, and it would be too precarious to rely on the driver's judgment to graduate the cylinder pressure down as speed fell off. With the new brake a very high initial percentage of braking is obtained, in both service and emergency, and the brake cylinder pressure is automatically controlled, in proportion to speed, by means of a very simple retardation control system, incorporated



Union Pacific Railroad 900 b.h.p. diesel-electric train

in an instrument known as a decelekron. The vital portion of this is a sliding weight, of about 100 lb., delicately mounted on ball bearing rollers and arranged to move in the line of motion of the train. A calibrated spring and air piston prevent its initial movement. This weight, levered to a pneumatic valve, controls the brake cylinder pressure in direct proportion to the retarding effect. When retardation exceeds the safety limit the sliding weight automatically reduces the braking action, and this reduction continues until, before coming to rest, there is just sufficient air in the brake cylinders to arrest the train without lurching or jarring. During recent road tests with the first train this new brake effected service stops from 90 m.p.h. in 2,745 ft. One has only to compare this result with a service stop of a normal steam train of 2,500 ft. to 3,000 ft. from a speed of 60 m.p.h. and square the speeds to realise the effectiveness of the new brake.

NOTES AND NEWS

New American Diesel Plant.—The Illinois Commerce Commission has given permission to the Indiana Harbour Belt Railway to sell 70 acres of land at McCook to the Electro-Motive Corporation (a subsidiary of General Motors Corporation) as a site for a new diesel locomotive works.

American Government Diesels.—Two 53-ton, 300-b.h.p., diesel-electric shunting locomotives have been ordered from the American Locomotive Company by the United States Navy Department. They are to be fitted with the McIntosh & Seymour "Alco" type of engine.

Danish Diesel Train Sheds.—The four new 1,100-b.h.p. diesel-electric trains of the Danish State Railways (see *Diesel Railway Traction Supplement* for August 10, 1934, and April 19, 1935) are to be stabled in a special shed at the new marshalling yard for passenger stock at Svanemollen, near Copenhagen.

Dutch Light Railcars.—In the issue of this Supplement for March 22 we described an 85-b.h.p. railcar on the Maas Light Railway which is fitted with a Stork-Ganz engine. This vehicle was rebuilt from an old passenger carriage, and has given such economical operation that two more vehicles have been fitted out in a similar manner, one with an 85-b.h.p. Stork-Ganz engine and the other with a 110-b.h.p. engine of the same make. The increased power of the third vehicle is due to a higher speed being required.

Dutch Streamlined Trains.—The five Stork-Ganz engined triple-car trains which have been running on the Netherlands Railways since November last have covered about 50,000 km. (31,000 miles) each. Inspection of one of the engines after running 45,000 km. (28,000 miles) showed it to be in perfect condition. The system of engine speed regulation incorporates an oil regulator and a servo motor and was evolved to overcome the troubles which occurred in the 35 Maybach-engined sets. It is reported to be acting successfully.

Zephyr News.—The Chicago, Burlington & Quincy Railroad has ordered yet another triple-car Zephyr train—the fourth. It is to maintain a fast service over the 221 miles from St. Louis to Burlington, and will make one round trip a day. This train is to be named *Mark Twain*, after the great humourist, who was a native of Hannibal, Mo., which is on the route from St. Louis to Burlington. Two of the cars on the train will be named *Tom Sawyer* and *Huckleberry Finn* respectively. The original Zephyr recently made a tour over the Seaboard Air Line to Miami and Florida, but is now back in normal service between Kansas City and Lincoln. To compete with it, the rival Missouri Pacific Railroad has accelerated its steam service to 3 hr. 59 min. for the 199 miles from Omaha to Kansas City, but the timing of the Zephyr has just been reduced from 4 hr. to 3 hr. 55 min. The second and third Zephyr trains are now in service between Chicago and the Twin Cities on a timing of 6½ hr., but when making a trial run on April 6, one of them covered the 431 miles from Chicago to St. Paul in 5 hr. 33 min. at an average of 77·6 m.p.h. The top speed on this occasion is reported to have been 104 m.p.h.

Indian Shunting Locomotive.—The Bombay, Baroda & Central India Railway has ordered a 47-ton broad-gauge, diesel-electric shunting locomotive of 350 b.h.p. from Armstrong, Whitworth. This unit will be similar in design to the 10 locomotives now being built for the L.M.S.R.

Egyptian Diesel Cars.—The Ganz diesel railcars which are being built for the Egyptian Government Railways are to be set to work on the following lines: Cairo–Suez direct; Bab el Louk–Helwan; Cairo–Barrage (winter only); Alexandria–Abu Qir (summer only); Alexandria–Hammam–Luka.

McLaren Engines.—Lest the impression be gained from the article on the 150 b.h.p. McLaren engine in the April 19 issue of this Supplement that this engine is the largest made by J. & H. McLaren Limited, we would state that this firm is now manufacturing oil engines of a type suitable for railway work in sizes from 20 to 320 b.h.p. at rotational speeds of 1,250 to 1,000 r.p.m.

Flying Hamburger's 1,000 Runs.—On April 30 the Flying Hamburger made its thousandth single trip between Berlin and Hamburg at a schedule of 77·4 m.p.h. in the down direction and 76·3 m.p.h. in the up. On this service it has conveyed 80,000 passengers and run a mileage of 178,000 since going into regular service on May 15, 1933. Including preliminary trials and subsequent test trips over other routes, its gross mileage is in excess of 200,000.

Buenos Aires Railcars.—As noted in the issue of this Supplement dated February 22 (p. 365), the Buenos Aires Provincial Railway has ordered four 270-b.h.p. diesel-electric railcars from Sulzer Bros., of Winterthur. The electrical equipment is to be built by Brown Boveri, at Baden, and it is expected that the cars will be delivered at the end of this year. Actually, this order was placed a year ago (see THE RAILWAY GAZETTE, January 12, 1934), with the Spanish Babcock & Wilcox Company, but as that organisation found it impossible to follow all the conditions laid down, the contract was cancelled, and given to Sulzer.

Spanish Railcar Services.—With the beginning of the summer timetables on May 15, a diesel railcar service was inaugurated on the M.Z.A. line between Madrid and Cuenca and from Toledo to Guadalajara. The vehicles used on the Cuenca service have 410-b.h.p. Maybach engines and electric transmission; those on the Toledo line have 210/230-b.h.p. Burmeister & Wain two-stroke engines. On the Norte Railway, the 150-b.h.p. Ganz cars are maintaining a service over the Madrid-Avila line, which is now being electrified. All the above-mentioned vehicles were described in the comprehensive article on Spanish diesel developments published in the issue of this Supplement for February 22.

XUM

TRANSMISSIONS FOR DIESEL LOCOMOTIVES AND RAILCARS

The H. & N. Fluid Power Transmission

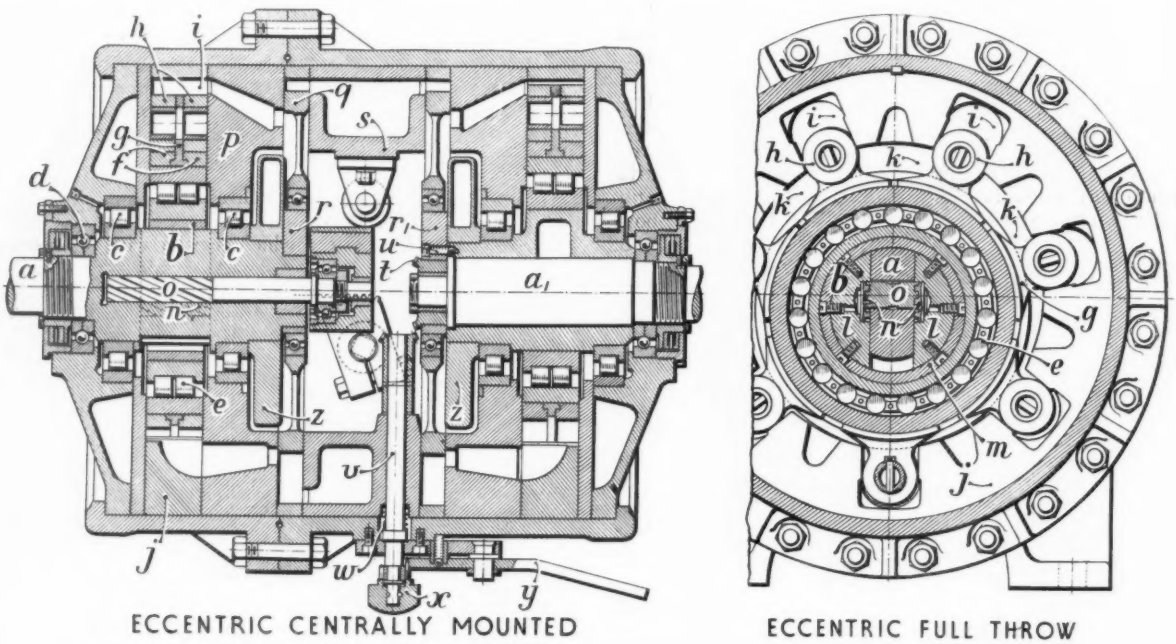
By STUART MIALL, B.Sc.

FOR the development of large driving wheel torques by an hydraulic motor relatively small quantities of fluid must be supplied at a high pressure, and under this condition leakage, and the by-passing of fluid from the high pressure side of the apparatus to the low pressure side, may easily be enough in any but a well made unit to produce a slip or lost motion effect of 50 per cent. or more. For the development of high speeds with a relatively small driving wheel torque the pump must be set to deliver a large supply of fluid at a moderate or even low pressure. Leakage and by-passing are practically absent under this condition, but, on the other hand, the fluid tends to attain high velocities in the various passages comprising its circuit, and the resultant eddying may dissipate a large proportion of the total power. Inefficiency from this cause can only be circumvented by providing passages of a liberal size, and by avoiding maximum fluid pressure of 800 lb. per sq. in. Eddying losses at low tractive efforts and high running speeds are restricted by designing for a maximum pump and hydraulic motor speed of 600 to 1,500 r.p.m. depending on the size of the unit.

The efficiency curve of the H. & N. transmission closely resembles that of any good electrical transmission, but at the highest speed normally used it is still short of the point where serious falling off occurs, and the maximum value may be taken as 84 per cent. This result was obtained during tests on a 100 h.p. transmission conducted by Professor Gibson at the University of Manchester.

Principles Governing Size Standardisation

The horse-power of the pump or of the motor unit will vary directly as the fluid pressure and the speed, and directly as the cube of the linear dimensions. Haslam &



a—Shaft of pump unit.
a$_1$—Secondary shaft.
b—Variable-throw eccentric sleeve.
c—Roller bearings.
d—Ball bearing.
e—Double-row roller bearing.
f—Retaining rings.
g—Roller carriers (seven in number).
h—Pair of rollers.
i—Tee slots.
j—Annular casting.
k—Spaces in oil circuit.
l—Bronze segments of eccentric.
m—Steel ring of eccentric.
n—Diagonally-grooved bronze plates.
o—Rod for varying eccentricity.
p—Port plate.
q—Ring-shaped valve.
r—Eccentric (leading main eccentric by 90 deg.).
r$_1$—Reverse eccentric.
s—Central casting.
t—Reversing bevel.
u—Bell catch.
v—Operating spindle.
w—Spring.
x—Knob.
y—Reversing lever.
z—Balance weights.

Fig. 1—General arrangement of Haslam & Newton hydraulic transmission

as far as possible sudden enlargements or contractions of the area of flow. A limit must also be put to rotational speeds.

In the latest hydraulic transmission, namely the Haslam & Newton patent fluid power transmission—the slip at high tractive efforts is minimised by a construction permitting the use of very small clearances and the quite moderate Newton uses the same pressure for large, medium, and small units, and the speed of rotation is arranged to be inversely as the linear dimensions to keep the velocity of the fluid in the various ports at the same figure in all sizes. To see the connection thus established between the horsepower capacity of various units and their speeds of rotation we may consider what happens when we pass

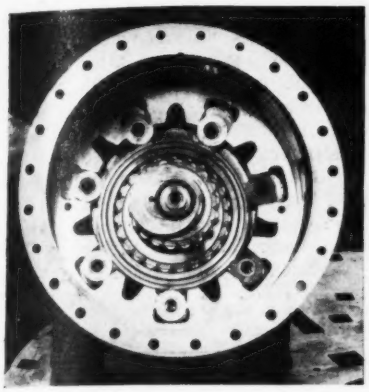


Fig. 2 (above)—Cylinder of rotary pump

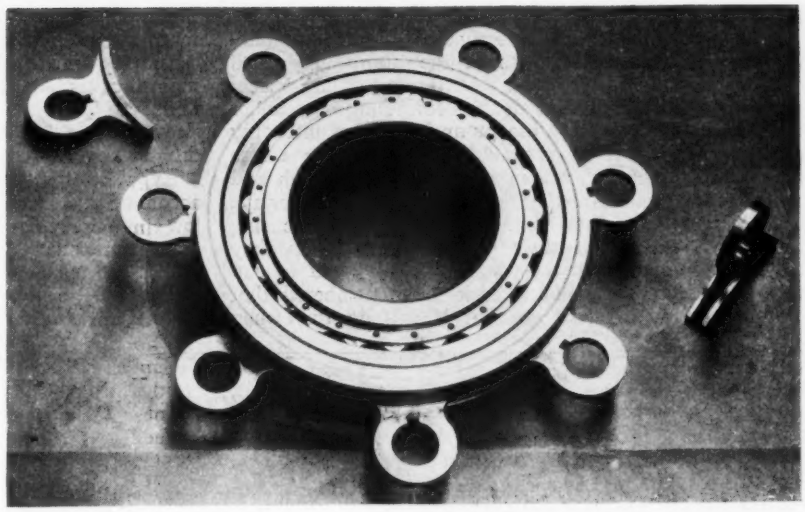


Fig. 3 (right)—Eccentric sleeve with roller carriers, H. & N. transmission

from a unit of one size to another having its dimensions twice as large. On account of the speed being halved the h.p. would be halved, but doubling the dimensions multiplies the h.p. by eight, so that on the whole the h.p. will be quadrupled. Thus the correct speed of rotation diminishes with the h.p. capacity of the unit, its variation being inversely as the square root of the h.p. The linear dimensions increase with the h.p. capacity, their variation being directly as the square root of the h.p. The weight varies as the cube of the linear dimensions and hence as the h.p. capacity raised to the power three over two. The 100 h.p. H. & N. unit for industrial applications is designed for a maximum speed (1 to 1 ratio) of 750 r.p.m., and it weighs 1,200 lb. Using the above relations it is easy to compute the figures for a unit of any other power.

Railway Traction Units

In traction work it is necessary to be able to absorb full engine power with the transmission giving any speed reduction from 6 to 1 to unity. The motor unit of a fluid transmission must therefore be capable of delivering six times the maximum torque input to the pump. The pressure in pump and motor being the same the linear dimensions of the motor must be $\sqrt[3]{6}$ or 1·82 times those of the pump, if the latter is direct coupled. The motor dimensions for a torque multiplication of six need only be $\sqrt[3]{3}$ or 1·44 times those of the pump in this case at 800 lb. per sq. in. The pump can only absorb the full input torque when delivering at full capacity. However the units stand 1,200 lb. per sq. in. without suffering in any way, and for starting a heavy train the engine may be more usefully employed in turning the pump at fractional capacity against this higher pressure.

The pump and motor units of the H. & N, transmission are similar to one another and it is sufficient to explain the construction of the pump, a sectional view of which is given in Fig. 1. A space which may as a first approximation be considered as cylindrical is partially occupied by a cylindrical sleeve *b* carried eccentrically on the input shaft *a*. The space between the eccentric sleeve and the enclosing cylinder can be made an annular one by reducing the eccentricity of the sleeve to zero, but whatever the value of the eccentricity this space is sectionalised to form seven compartments and each compartment provides a breathing action as the eccentric sleeve is revolved. Sectionalisation is provided by hardened rollers which can bear on the eccentric sleeve and reciprocate in radial slots cut in the cylinder wall. Fig. 3 shows the eccentric sleeve with the roller carriers *g* which occupy a tee slot *i* round its periphery. The rollers *h* (two per carrier) revolve on double-ended pins which are pressed into the carriers and pegged therein to prevent rotation. When pressed towards the pump axis the rollers bear on the eccentric sleeve as the carriers just fail to reach the bottom of the tee slot. The clearances between the carriers and the tee slot are small without being impracticably so from a manufacturing point of view.

Fig. 4 shows the member which covers up what can be seen in Fig. 2. It forms the endface of the pump cylinder and has ports in the plate *p* which register with the spaces beyond and between the rollers—14 ports in all. Emerging on the other side these ports come beneath the action of a ring-shaped valve *q* which is actuated by an eccentric as shown in Fig. 4. Ports opening outside this ring valve are in communication with spaces which are contracting and therefore delivering fluid under pressure. Ports opening inside the ring let fluid into spaces which are expanding. The fluid used is an oil and since this is incompressible the ports are made of exactly the same width as the valve ring, and the valve timing is such that a port is only closed at the instants when the space from which it comes neither expands nor contracts. Two such instants occur in each revolution of the pump. The valve operating eccentric can be turned through 180 deg. to give a reverse motion to the motor receiving fluid from

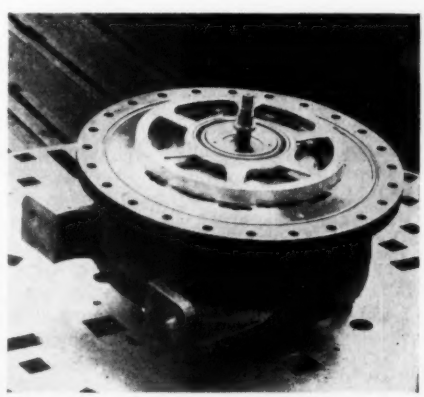


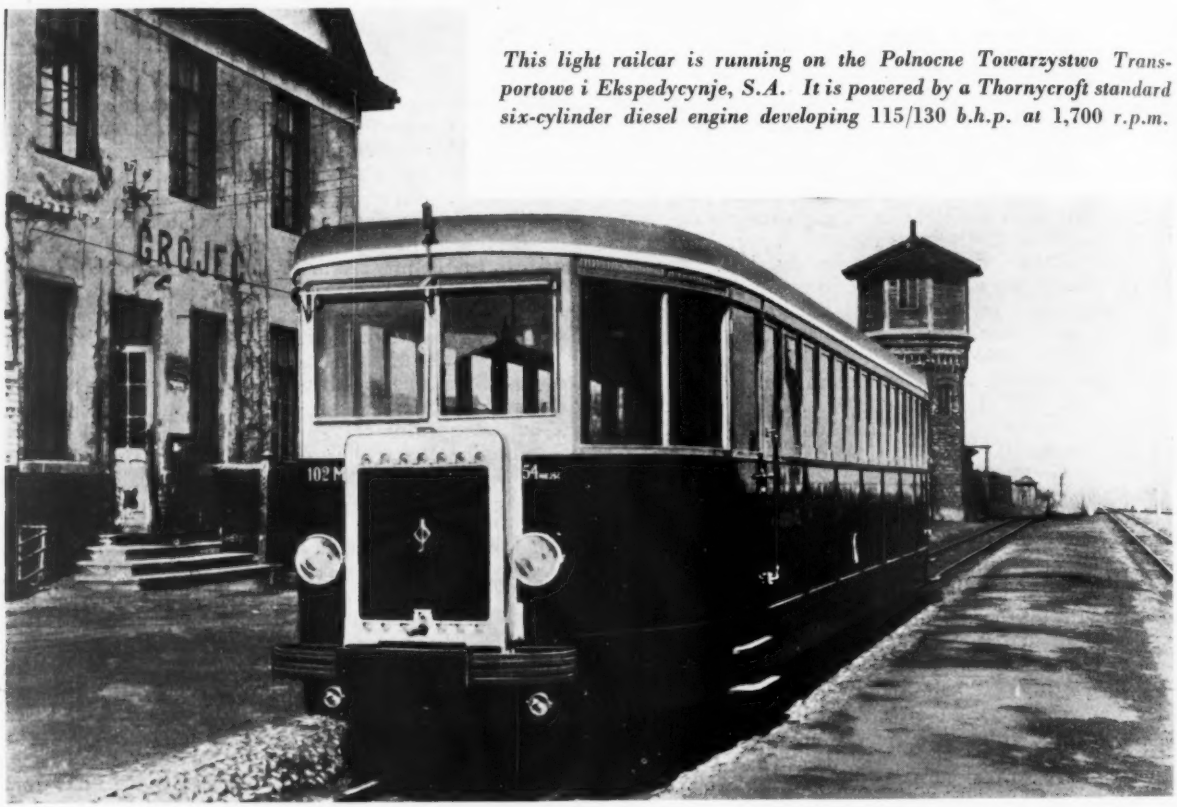
Fig. 4—View showing ported end cover and ring valve in situ, H. & N. transmission

it, and it resembles closely the slip eccentrics used on toy steam locomotives.

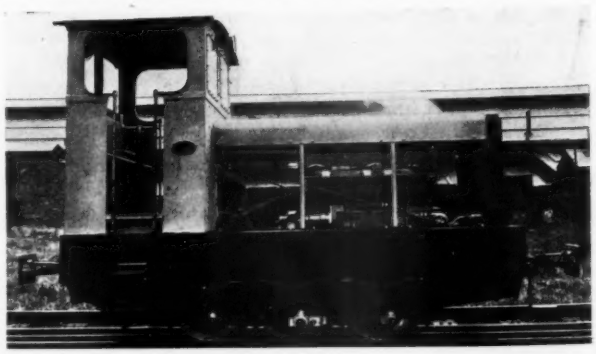
It may be pointed out here that at any instant only two of the seven roller pairs in the pump are called upon to effect a pressure seal. All the expanding spaces are under one pressure and all the contracting ones under another, so that in reality the pump is divided into only two regions and not 14 as would appear to be the case from Fig. 2. The two rollers which divide the high and low pressure regions are pressed inwards and sideways so that they make line contact with the eccentric ring and with the walls of their particular slots. As they roll on these slot walls they might be supposed to slip on the eccentric ring, but it is to be remembered that this ring is free to turn so that it will do this when a pair of rollers under pressure rotate in contact with it. The eccentric ring shown in Fig. 3 is carried on a split sleeve containing the mechanism whereby the eccentricity is varied. A rod *o* passing through the hollow mainshaft is shaped at one end into a multiple-face wedge to engage with similar wedge faces in the split sleeve *l*, and by moving the other end of this rod any desired change in the eccentricity can be effected.

Expansion of the oil due to rises in temperature is accommodated by the provision of an air vessel on the low pressure side of the system which consists of the passages carrying the oil back from the motor to the pump. Any oil coolers which may be necessary are inserted on the low pressure side, as the high pressure connection must necessarily be direct and free.

POLISH RAILCAR WITH A BRITISH ENGINE



This light railcar is running on the Polnocne Towarzystwo Transportowe i Ekspedycynje, S.A. It is powered by a Thornycroft standard six-cylinder diesel engine developing 115/130 *b.h.p. at* 1,700 *r.p.m.*

Diesel for Mexican Oil Wells

The illustration in the next column shows one of the 74 b.h.p. Gardner-engined diesel locomotives supplied to the Eagle Oil & Shipping Co. Limited, by the Drewry Car Co. Limited. Eight Drewry diesel locomotives of 50 and 74 b.h.p. have now been sent to the Mexican fields of the Eagle Oil organisation. The locomotive shown weighs 7½ tons and runs on the 2 ft. gauge. On test it exerted a maximum drawbar pull of over 4,500 lb., and maintained a pull of 3,640 lb. in bottom gear, and pulls of 1,680 and 1,400 lb. respectively, in second and top gear. The overall length of the locomotive is 12 ft. 10 in., the height 9 ft. 6 in., and the wheelbase 5 ft.